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ABSTRACT

Summaries of 99 selected studies in industrial education reported during the 2-year period, 1960-61, are listed alphabetically by researcher in three categories: doctoral studies, master's studies, and staff studies. A subject index covering areas of research interest is also included. Related documents are available as VT 011 370 and VT 011 371 in this issue. (GR)

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Vocational Division Bulletin No. 299
Trade and Industrial Education Series No. 75

Research in Industrial Education

Summaries of Studies 1960-61

Prepared by

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Teacher Training and Service Studies
Division of Vocational and Technical Education

In cooperation with the Research Committee
of the National Association of Industrial
Teacher Educators

U.S. DEPARTMENT OF
HEALTH, EDUCATION, AND WELFARE
ABRAHAM RIBICOFF
Secretary

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Foreword

CONTINUING TECHNOLOGICAL ADVANCES are bringing abount changing occupational patterns and, hence, changing educational needs of youth and adults. This constitutes a challege to industrial educators to plan and operate programs that will be of maximum effectiveness. Research has always been considered an integral part of industrial education and has been used to identify significant values and strengths in current programs as well as to determine guidelines for program development. The purpose of this publication is to permit ready identification of this available research by those concerned with program development or program operation. Persons desiring more detail on particular studies than is included in this report may wish to obtain the complete study from the source indicated in the summary.

The bulletin includes summaries of selected studies in industrial education completed during a 2-year period, 1960–61. These studies are listed alphabetically by researcher in three categories: doctoral studies, master's studies, and staff studies. A subject index covering areas of research interest is also included in the bulletin.

This is one in a series of publications on research studies developed by the Trade and Industrial Education Branch. The first of the series, *Research in Industrial Education, Summaries of Studies, 1930–1955*, brought together in one volume summaries previously prepared by the Research Committee of the National Association of Industrial Teacher Educators and published by the American Vocational Association for the period 1930 to 1950 and summaries of other studies completed before August 1955. The second publication, *Research in Industrial Education, Summaries of Studies, 1956–1959*, was prepared by the Specialist, Teacher Training and Service Studies, Trade and Industrial Education Branch, in cooperation with the Research Committee of the National Association of Industrial Teacher Educators. This third bulletin brings up to date the publishing of summaries of studies through 1961.

Publication of this bulletin has been made possible through the cooperation of the Research Committee of the National Association of Industrial Teacher Educators, which has compiled and screened the summaries, functioning under the leadership of Dr. John W. Karnes, Jr., Chairman. The undertaking and completion of such a project would have been impossible, however, without the cooperation of institutional staff members who have been responsible for directing the preparation of the summaries by the researchers and for preliminary screening and editing.

Members of the Research Committee of the National Association of Industrial Teacher Educators are: Chester B. Ainsworth, Oregon State College; Melvin L. Barlow, University of California, Los Angeles; Leslie L. Gibbons, Colorado State University; James R. Hasting, State University of New York, Oswego; Ivan Hostetler, North Carolina State College; John W. Karnes, Jr. (Chairman), University of Connecticut; S. Lewis Land, Pennsylvania State University; James H. Mahoney, North Texas State University; Donald Maley, University of Maryland; Roland F. Nagel, Northeast Missouri State Teachers College; Walter J. Robinson, Northwestern State College, Louisiana; Ralph C. Wenrich, University of Michigan; and Frank J. Woerdehoff, Purdue University.

WALTER M. ARNOLD,
Assistant Commissioner for Vocational and Technical Education.

Contents

Summaries of Studies 1960–61

NOTE: L. indicates that the study is available at the library of the institution mentioned; * indicates that the study is available on microfilm.

Doctoral Studies

4236. ADAMS, AARON F. *Specialized Tasks Performed by Foremen in Selected Small Industrial Companies.* Ed. D. 1961, University of Cincinnati, 131 p. L. (Cincinnati, Ohio)*

Purpose of study: To determine if foremen in small companies perform tasks which are performed by specialists in a large company.

Source of data and method of study: Organization charts of large companies were analyzed to determine typical manufacturing service or staff departments. Specific tasks were identified through study of a large industrial company. A survey of small companies was conducted to establish which specialized tasks were performed in small companies and to determine who, including foremen, performed them.

Findings and conclusions: As many as 12 manufacturing service departments performed at least 70 specialized tasks directly related to the production foreman's function.

In general all small companies required specialized services. Persons, other than production foremen, were responsible for the service function.

There seemed no justification for specialized manufacturing service training for foremen of small companies.

4237. AKHUN, ILHAN ISMAIL. *Turkish Engineering Students Studying in the United States.* Ed. D. 1961, University of Missouri, 150 p. L. (Columbia)*

Purpose of study: To ascertain the background, characteristics, difficulties, future plans, and opinions of Turkish engineering students studying in the United States during the fall semester, 1960–61.

Source of data and method of study: Data were obtained through an information form mailed to 332 Turkish engineering students in 76 institutions. Usable forms were received from 242 students.

Findings and conclusions: Turkish undergraduate engineering students studying in the United States are older than American students. It appears that English, as it is being taught as a foreign language in Turkish public schools, does not satisfactorily prepare Turkish students to study abroad.

Where Turkish engineering students have a choice, they would select the institutions which they are to attend on the basis of the reputation of the institution. It appears that lack of finances and lack of competency in the use of English are the most serious difficulties encountered by these students studying in the United States. They do seem determined to return to Turkey.

The ultimate educational goal of Turkish engineering students studying in the United States appears to be attaining a graduate degree. Generally, they are satisfied with the institutions in which they are enrolled.

Turkish engineering students who are graduates of higher institutions in Turkey tend to not favor the idea of sending Turkish secondary school youth to the United States, immediately after graduation, for undergraduate study of engineering. They prefer that these students spend some time in Turkish institutions and come to the United States for advanced study.

4238. BAILEY, JAMES HAMILTON, JR. *Relation of Instruction in Industrial Arts to Knowledge of Design.* Ed. D. 1961, University of Missouri, 131 p. L. (Columbia)*

Purpose of study: To ascertain the relation of experience in industrial arts to achieve-

ment in design as measured by an instrument constructed specificially for the study.

Source of data and method of study: Data were obtained by administering the design test to a total of 806 students in 31 high schools in Michigan during the school years of 1959–60 and 1960–61. Six groups of high school senior boys, with increasing amounts of industrial arts, were compared on their knowledge of design. Analysis of variance was used to find out whether the groups differed significantly in their design scores, intelligence, and scholastic ability. Design score means were then adjusted statistically to allow for variations in intelligence and scholastic ability.

Findings and conclusions: Continued study of industrial arts, as represented by the possession of more units of industrial arts, does not yield an advanced knowledge of design. Apparently, neither industrial arts departments nor art departments are making significant contributions to the design knowledge of high school senior boys as measured by the instrument used in this study.

4239. BAIRD, RONALD JAMES. *The Application of John Dewey's Philosophy to Industrial Arts.* Ed. D. 1960, Michigan State University, 256 p. L. (East Lansing)*

Purpose of study: To develop a consistent philosophical approach to a program of industrial arts teacher education based upon the beliefs and theories of John Dewey.

Source of data and method of study: Material for the study consisted of the majority of the writings of John Dewey and writings by industrial arts teacher educators concerning the experimentalist position. The study is philosophical research using the critical interpretation approach.

Findings and conclusions: It was concluded that a program based on experimentalism would reflect man's needs in his social environment. The objectives of the industrial arts teacher education program would be unique only to the profession of teaching and would emphasize the values of democracy, scientific methodology, social efficiency, and the place and needs of man in our industrial society.

In the curriculum, the emphasis of subject matter would be on activities involving materials rather than on materials man works with in satisfying his goals. The curriculum would induce activities of problem-solving, experimentation, investigation, critical thinking, and extensive planning, research, and creativity.

4240. [illegible]SER, JAMES ALBERT. *Cu[illegible]lum and Other Implications Resulting from a Study of the Graduates and Drop-Outs of the Terminal Vocational Industrial Education Program at the Norfolk Division of Virginia State College 1950–1954.* Ed. D. 1960, The Pennsylvania State University, 199 p. L. (University Park)*

Purposes of study: To determine how well former vocational trade students of the Norfolk Division of Virginia State College have adjusted to employment and also to determine what implications there were for curriculum adjustment.

Source of data and method of study: Data were obtained from school records, interviews with 107 graduates, mailed instruments from 124 drop-outs, instruments from Negro Land-Grant Colleges, and pertinent literature. Comparisons were made between graduates employed in the trade fields for which they had been trained and those graduates not employed in fields for which they had been trained.

Findings and conclusions: There were no significant differences between the two groups of graduates with respect to age, marital status, veteran's status, additional education, factors influencing vocational choice, and previous educational level. Early first job placement in trade fields for which they had been trained seemed to be an important factor in holding vocational trade graduates in their fields.

Principal job referral sources were friends, relatives, civil service, and own efforts. Neither the State employment service nor the school was very effective as a job referral source. Procedures found to be helpful by Negro Land-Grant Colleges in placing vocational trade graduates were: (1) Contact with employers, (2) internship programs, (3) alumni assistance, (4) advisory committees.

Limited practical experience was the greatest single obstacle to placement of graduates. Other obstacles were racial employment policies of employers and lack of jobs. Voluntary job changes by graduates tended to show a desire to improve economic and social status.

Limited program offerings and low economic status of enrollees in the vocational trades program were the underlying causes of most drop-outs.

Vocational trades programs in the local area, including apprenticeship, were inadequate to meet present and anticipated needs of the community. Recommendations indicated a need for a trade coordinator, an internship program, refinement of the recruitment program, better trade guidance, and a continuous followup program.

4241. BROWN, B. WESLEY. *Characteristic Differences of Trade School Students and Their Bearing on Post-School Occupational Plans.* Ed. D. 1960, University of Missouri, 192 p. L. (Columbia)*

Purpose of study: To ascertain differences among day-trade students who intended to enter the occupation for which they were being trained, students who intended to enter an occupation other than the one for which they were being trained, and students who had made no occupational plans.

Source of data and method of study: Data concerning 378 day-trade seniors were obtained from an information form, the Strong Vocational Interest Inventory, the Ohio Psychological Examination, and grade-point averages in 37 schools in Missouri. Principals, counselors, and day-trade instructors of these seniors were interviewed to obtain selection factors used in enrolling these students.

Findings and conclusions: Of the 378 participating seniors, 125 intended to enter the occupation for which they were being trained, 126 intended to enter an occupation other than the one for which they were being trained, and 127 had made no occupational choice. The most important factor, other than advice of individuals, influencing seniors to enroll in the day-trade program, was experience in industrial arts. Seniors who planned to enter the occupation for which they were being trained were likely to be enrolled in large, urban-area day-trade programs. Principals, counselors, and day-trade instructors seemed to be unaware of local, State, or National labor market needs, or the importance of such needs in enrolling students in the programs.

4242. BROWN, GEORGE J. *Manipulative Operations and Electronic Equipment Needed in Industrial Teacher Education Based on Industrial Practices.* Ed. D. 1960, University of Missouri, 196 p. L. (Columbia)*

Purposes of study: To ascertain what manipulative operations the electrical worker should be able to perform in the areas of electricity and electronics; to find out what type and size of electronic equipment is needed for this purpose; and to compare the above-mentioned manipulative operations and equipment with operations taught and equipment used in industrial teacher education.

Source of data and method of study: Data were secured through information forms obtained from representatives of 65 electronics manufacturing companies, 46 repairmen and technicians employed in servicing electronics equipment and devices, and 70 college instructors who teach in industrial teacher education departments offering two or more courses in electricity and electronics.

Findings and conclusions: Service manuals and books seem to be inappropriate as textbooks in courses designed for prospective industrial arts teachers. There seem to be few differences in the sizes or types of equipment used in electronics manufacturing and that used in electronics servicing. Types and sizes of electronic test equipment used by electronics production workers and repairmen appear to resemble closely the types and sizes used in courses taught by college respondents.

In contrast with industrial practices, electrical courses offered in industrial education departments for prospective teachers tend to include manipulative operations which are limited chiefly to electricity. There appears to be a rather close agreement between the extent to which various operations occurred in work performed by electronics production workers and repairmen, and the extent to which the same operations were found in courses taught by college respondents.

4243. BUXTON, ROBERT EDWARD. *The Identification of Physical Science Principles for Industrial Arts Metalworking Content.* Ed. D. 1960, University of Maryland, 302 p. L. (College Park)*

Purposes of study: To ascertain basic principles of chemistry and physics involved in selected processes of the metalworking industries and to develop subject matter for the industrial arts metalworking program consistent with relationships between scientific principles and industrial processes, with suggestions appropriate to the industrial arts program at the secondary level.

Source of data and method of study: A list of 249 principles of physics and chemistry by Wise, and another of 125 principles, mainly metallurgical derived by the writer, were utilized in the study. Ten industrial processes were selected from classifications by Begeman and by Vance. An abridgement of each process was written. An analysis of each process was made in an attempt to identify the scientific principles. The symbol of each principle found to be involved was inserted in context at the point of involvement. All materials were submitted to a group of 12 consultants in science, science education, and engineering. Approved principles were tabulated and analyzed to determine the number and kinds of principles involved in each process.

Findings and conclusions: A total of 197 principles from all the lists was found to have 483 applications in the 10 processes. Principles related to heat, the properties of energy

and matter, the chemical nature of matter, and the structure of matter were found to be involved in all the processes. The abridged processes with the integrated principles may serve as subject matter from which content may be drawn for a given course, once the objectives of the course have been determined.

4244. COTRELL, CALVIN JAMES. *A Study of Factors Essential to Staffing Post-Secondary Technical Education Programs.* Ph. D. 1960, The Ohio State University. 178 p. L. (Columbus)*

Purpose of study: To obtain information helpful to administrators concerned with the problems of recruiting and selecting competent technical teachers for postsecondary technical education programs.

Source of data and method of study: Data were obtained through the use of a questionnaire which was sent to selected administrators and technical teachers. Respondents represented forty-eight 2-year publicly controlled postsecondary technical schools located in California, Michigan, New York, and Texas.

Findings and conclusions: The major findings and conclusions of the study pertain to the following: (*a*) The most important media for locating potential technical teachers; (*b*) the significant motives which influence persons to enter technical teaching; and (*c*) the tangible elements, other than personality factors, which should be considered in the selection of potentially competent and effective technical teachers.

4245. DE VORE, PAUL WARREN. *Determination of Basic Learnings in Graphic Representations Essential to Employee Adaptation in Production Industries.* Ed. D. 1961, The Pennsylvania State University, 199 p. L. (University Park)*

Purpose of study: To determine from the experience of supervisory personnel and production workers, in selected production industries in the Commonwealth of Pennsylvania, those areas of graphic representations most useful in adapting to employment changes resulting from technological innovations.

Source of data and method of study: Research was conducted by use of a structured interview employing a series of 21 interview cards displaying basic types of graphic representations or types of mechanical drawings. The results of the study were based on 141 hour interviews. Twenty-eight different industries selected from 13 Department of Commerce Industrial Classifications cooperated by permitting interviews of 5 personnel classifications.

Findings and conclusions: A definite hierarchy of usefulness of 21 classifications of graphic representations was discovered, for both present employment and training. Graphic representations determined useful for adaptation and training in the industries investigated were those determined as basic to job performance during present employment.

A common base of graphic representations was determined to exist among the diverse production industries investigated and a "true" rank order of graphic representations for both present employment and training existed for each skill level. A greater similarity than difference existed in the selection of graphic representations for various skill levels for both present employment and training.

A definite difference existed in the determined usefulness of graphic representations for each skill level investigated, and the higher the skill level the greater the established usefulness of selected graphic representations for both present employment and training.

The results of the reasearch established that, for all respondent categories, there was no significant difference in the need or use of graphic representations by skill levels during training versus present employment. A tendency existed in the skilled production worker category to select graphic representations as being more useful for present employment than for training. A significant difference was established, by the unskilled production worker category, favoring the usefulness of graphic representations for training versus present employment.

4246. GROTE, CHARLES NELSON. *A Comparison of the Relative Effectiveness of Direct-Detailed and Directed Discovery Methods of Teaching Selected Principles of Mechanics in the Area of Physics.* Ph.D. 1960. University of Illinois, 337 p. L (Urbana)*

Purpose of study: To provide additional formal research regarding the relative effectiveness of two comparative methods of teaching technical materials. The design permitted a test for differences between groups on the basis of an ordering of treatment sequences, as well as testing for differences between differential treatment groups.

Source of data and method of study: An analysis of variance factorial design, by sex by levels by treatment was employed in this experiment. Three ability levels were established on the basis of an outside criterion. Following the first instructional period, the

two initial experimental groups were subdivided to form a total of four treatment groups. A single control was maintained throughout the experiment.

Subjects were randomly selected from a single eighth-grade class in a suburban junior high school. Experimental groups were taught selected principles of mechanics, as they apply to groups of simple machines. The two experimental sessions, spaced 8 days apart, provided approximately 39 minutes of instruction during each session. All oral instruction was presented by tape recordings. The control group was uninstructed but participated in the testing program.

Six criterion tests were administered during four testing sessions. Initial learning tests were given after each instructional period and a combination retention and transfer test was administered at 1 and 6 weeks following instruction. All tests were multiple-choice power tests.

Findings and conclusions: The analysis of variance design was employed for the primary statistical treatment of data by treatment comparisons. From this analysis, it was found that:

(1) The group instructed by the direct-detailed method was superior to the directed-discovery group as measured by the first initial learning test. However, there was no difference between these groups when measured for initial learning following the second lesson, or for retention and transfer at 1 and 6 weeks.

(2) The group taught two lessons by the direct-detailed method was superior to the group taught by the direct-detailed method followed by the directed-discovery method as measured for retention at 1 and 6 weeks. The group taught by the directed-discovery method followed by the direct-detailed method was superior to the direct-detailed groups as measured by the 1-week transfer test.

(3) The group who had been taught by the directed-discovery method preceding the direct-detailed presentation was superior to the group taught by the reverse sequence, when measured for initial learning following the second instructional period, and for retention at 6 weeks. The same sequence was superior when measured for transfer at 1 week.

(4) When a difference in achievement was found on the basis of the sex variable, the male subjects were superior to the female subjects as measured by the criterion tests.

(5) The relative effect of the methods, as well as certain treatment sequences, were dependent, in part, upon the sex and/or ability level of the subjects.

4247. HARRIS, VIRGINIA J. *Prediction of Success in a School of Practical Nursing.* Ed. D. 1961, University of Pennsylvania, 66 p. (Philadelphia)

Purpose of study: To discover factors or methods for identification of applicants who could be expected to succeed and those who could be expected to fail in the preclinical portion of a 1-year practical nursing program.

Source of data and method of study: The study was limited to the practical nursing program of the Brown Vocational High School from September 1956 to January 1959.

Data were collected for each of 129 practical nursing students concerning age, marital status, religion, race, years of schooling, and scores on six subtests of the General Aptitude Test Battery developed by the Occupational Counseling Services of the U.S. Employment Service. Each of these variables was correlated with each other and with the criterion—the preclinical grade average.

Findings and conclusions: The Q or clerical perception subtest score had an r of .52 with the criterion, which was significant at the 1 percent level and which was found to be the best single predictor of preclinical grade average, followed by the verbal subtest score with an r of .41 and the general learning ability subtest score with an r of .36.

The educational level of the applicant was correlated .370 with the criterion. This coefficient was significant at the 1 percent level and, consequently, was included as a predictor variable in the regression equation.

The predictor variables, V score, Q score, and educational level, in combination had a multiple correlation coefficient of .60 with the criterion. From the multiple correlation team and obtained *beta* coefficients, a regression or prediction equation was derived: $X_1 = .135X_2 + .149X_3 + 1.30X_4 + 40.2$, where X_2 is the V score, X_3 the Q score, and X_4 the years of schooling of the applicant.

4248. HAWLK, ROBERT HENRY. *A Comparative Study of Estimated Achievement by Industrial Arts Students and Students of Cooperative Work Experience Selected from the Public Secondary Schools of Pennsylvania, Ohio, and Michigan.* Ed. D. 1960, The Pennsylvania State University, 204 p. L. (University Park)*

Purpose of study: To determine and compare the estimated degree of attainment of validated industrial arts objectives by selected students of industrial arts, and selected students of cooperative work experience programs.

Source of data and method of study: Data were secured by use of personal interviews and questionnaires. Interpretations were made from statistical computations that included comparisons of averages, significant differences of means, and high estimated levels of achievement.

Findings and conclusions: Students of cooperative work experience achieved at a higher estimated level than students of industrial arts in regard to six of the nine validated industrial arts objectives. Industrial arts students achieved at a higher estimated level than students of cooperative work experience regarding two validated industrial arts objectives. Approximately equal estimated achievement was recorded for both compared groups of students in regard to one validated industrial arts objective.

The techniques of cooperative work experience could be suggested for adaptation by industrial arts instructors if an adjunct for the industrial arts curriculum is indicated as feasible and desirable for each respective school and community.

4249. HORINE, JOHN WILLIAM. *Relation of Experience in High School Drafting to Achievement in Engineering Drawing at the College Level.* Ed. D. 1961, University of Missouri, 140 p. L. (Columbia)*

Purpose of study: To ascertain the relation of experience of high school drafting to each of the following factors of achievement in college engineering drawing: drafting skill development, visualizing ability, informational achievement, attitude toward college engineering drawing, and final grades.

Source of data and method of study: Data were secured from engineering drawing teachers and students in six Missouri colleges, and from records on file with the Missouri Statewide Testing Service. Students were arbitrarily divided into three groups according to amount of previous experience in high school drafting. Analysis of co-variance was used to test significant differences between groups with regard to each criterion studied when college aptitude was held constant.

Findings and conclusions: Students with experience in high school drafting were found to have obtained lower Ohio State University Psychological Examination scores than students without such experience. Even so, students with experience in high school drafting obtained significantly higher skill grades, visualization test scores, and final grades in college engineering drawing than did students without such experience. Students with one or two semesters of experience in high school drafting were superior to students without such experience, and students with more than two semesters in high school drafting earned even higher skill grades, visualization scores, and final grades in college engineering drawing.

Mean informational achievement and mean attitude scores did not differ significantly among students in college engineering drawing who were grouped according to amount of previous experience in high school drafting.

4250. JELDEN, DAVID L. *Electrical Informational Content Included in Industrial Arts Teacher-Education vs Knowledge Required of Electronic Technicians.* Ed. D. 1960, University of Missouri, 171 p. L. (Columbia)*

Purpose of study: To compare the basic informational content of textbooks and other instructional materials used in electrical courses offered to industrial arts majors in teacher-education institutions with the basic electrical knowledge required of persons who work with electronic devices in industry.

Source of data: Data were secured from heads of departments of industrial (arts) education in 170 teacher-education institutions, instructors of electrical subjects in which industrial arts majors were enrolled, textbooks and other instructional materials used in electrical instruction for industrial arts majors and selected electronic manufacturing industries. The subject-matter analysis technique was used to obtain the topics of information contained in the instructional materials which were rated by industry.

Findings and conclusions: More than one-fourth of the industrial (arts) education departments did not require their majors to take any course work in electricity and/or electronics. Fifty percent of the electrical instruction is given in the industrial (arts) education department only and the physics and industrial (arts) education department together accounted for 72.5 percent of the electrical instruction. There is general agreement regarding content of electrical instructional materials, but few sources analyzed contained topics about recent developments in the area of electricity and electronics, such as transistors. Some lack of agreement exists in industry about required knowledge of electronics technicians. More electrical instruction should be required of Industrial Arts majors.

4251. KAVIEFF, MELVIN CHARLES. *Requirements for Selected Occupations in the Automotive Industry with Implications for Technical Education at the Postsecondary Level.* Ed. D. 1961, Wayne State University, 258 p. L. (Detroit, Mich.)*

Purpose of study: To determine requirements for selected occupations in the automotive manufacturing industry of the Detroit metropolitan area, with implications for technical education at the postsecondary level.

Source of data and method of study: A review of the literature in the area of postsecondary education was made. Various definitions for the technician were reviewed and analyzed to develop an operational definition for the study. A survey was conducted to obtain a consensus from industrial and educational authorities concerning technical occupation configuration and growth in the years ahead.

Findings and conclusions: The technician now defined and described in the literature has no rigid delimitation with regard to his function, range of operation, and definition.

A definite need exists for the development of educational programs and facilities to prepare industrial technicians for the Detroit automotive industry at the postsecondary level. It was determined that there were two technicians for every engineer in the Detroit automotive industry in 1960. Technicians are one of the fastest growing major occupational classifications in the United States.

The private technical institute has been quicker to adapt its programs to meet new and changing occupational needs than has the publicly controlled school.

4252. MARCH, BRYCE D. *Assessment of Informational Achievement in Industrial Arts.* Ph. D. 1961 Southern Illinois University, 256 p. L. (Carbondale)*

Purpose of study: To assess informational and problem-solving achievement in industrial arts mechanical drawing, electricity, metalwork, and woodwork as listed by instructors and State courses of study. This achievement is commonly expressed by the phrase, "Things the Student Should Know." Certain unique characteristics of industrial arts in the Missouri State schools were set forth as being incidental to the study.

Source of data and method of study: State courses of study were reviewed for a comprehensive list of "Things the Student Should Know." This list was validated by a jury of specialists in Missouri, including the State Director of Industrial Education and the State Supervisor of Industrial Education.

An informational test was prepared and administered to sample and pilot groups. Raw data for the main study were obtained from test answer sheets of students in industrial arts in the seventh-, eighth-, ninth-, and tenth-grade levels in Missouri during one scholastic year. Appropriate statistical analyses, including a 3x4x2 dimensional random replications design, were used in the treatment of data.

Findings and conclusions: In terms of the results of the test of their students the teachers with master's degrees were superior to those with bachelor's degrees. There was also a statistically significant difference between informational content achievement evidenced by the students of the inexperienced and the experienced teachers.

Those ninth-grade industrial arts students who had industrial arts in the seventh and/or eighth grade had better informational achievement results; and students in the districts other than the large city systems obtained the highest scores.

4253. MILLER, WILBUR R. *Levels of Readability of General Shop Textbooks Compared with Reading Abilities of Ninth-Grade Industrial Arts Students.* Ed. D. 1960, University of Missouri, 111 p. L. (Columbia)*

Purposes of study: To ascertain the readability of general shop textbooks used on the ninth-grade level, and to compare this readability with the reading abilities of selected ninth-grade industrial arts students.

Source of data: The readability levels of five general shop textbooks were obtained by the application of the Dale-Chall and Flesch formulas of readability. Measures of the reading abilities of 411 ninth-grade students from a specified area of central Missouri were obtained through a scheduled testing program. These measures of reading abilities, which were converted to grade equivalents, were compared with the readability ratings of the books.

Findings and conclusions: The difficulty levels of the textbooks ranged from an average of eighth-grade level to an average of tenth-grade level. The range of difficulty for the samples within each textbook was quite large (as much as 11 grade levels in one of the books). Electricity and plastics sections were consistently rated as most difficult to read. The reading abilities for the 411 industrial arts students ranged from fourth to twelfth grade level with a mean grade equivalent of 8.3. Approximately 86 percent of the students had reading abilities below tenth-grade level; however, at least 40 percent of the samples, taken from four of the five books, had readability ratings of tenth-grade level or higher. Only one of the textbooks received a readability rating which would indicate that a majority of the students could read it effectively.

4254. MOELLER, CARL ALBERT. *Aims for Undergraduate Industrial Teacher Education: A Study of Projected Aims and Supporting Principles as Evaluated by Selected Representatives of Labor and Industry.* Ed. D. 1961, Wayne State University, 254 p. L. (Detroit, Mich.)*

Purpose of study: To develop a series of aims and supporting principles for the direction of programs of industrial teacher education, evaluated by selected representatives of labor and industry. These aims, thus evaluated, are intended to be useful in the development and improvement of programs of undergraduate industrial teacher education in the United States.

Source of data and method of study: Data were provided as the result of a series of depth interviews with 38 selected representatives of labor and industry who evaluated a list of tentative aims and principles for the direction of programs of undergraduate industrial teacher education.

Findings and conclusions: Well-defined competency levels such as the commonly held concept of journeyman status for trade occupations, should be established for the several broad areas serviced by teachers of trade or technical subjects.

Apprenticeship experience is essential for te ching the manipulative phases of trade occupation, but is not necessary for the theoretical, or "related instruction" phases of an occupation. For more advanced levels of instruction, such as those necessary for upgrading programs in the skilled trades and for preparing technicians, the cooperative work study program is, tentatively, the best approach.

In addition to basic orientation, teachers of industrial arts should develop a depth competence in one or two of the industrial arts areas. Solution of practical problems requiring independent research and the application of scientific and technological principles is an effective method of developing this competence. Such experiences should be preceded by the development of fundamental skills in hand or machine operations.

An understanding of the social aspects as well as the technical processes of industry is essential for all teachers of industrial education and is best achieved through a balanced program of both academic orientation and actual work experience, neither of which is adequate by itself.

All teachers of industrial education must be thoroughly competent in all phases of the professional aspects of teaching, and should experience as broad a background in the liberal education phase of their preparation as teachers in other disciplines.

4255. MONROE, H. B. *Personality Variables of Industrial Arts Teachers.* Ed. D. 1960, Colorado State College, 78 p. L. (Greeley)*

Purpose of study: To differentiate between most and least successful industrial arts teachers by means of the Edwards Personal Preference Schedule.

Source of data and method of study: The application of the Edwards Personal Preference Schedule to a group of industrial arts teachers—evaluation of teachers most and least successful. Pattern analysis was by means of the Chi-Square test and difference in means by use of the t-test to determine the difference in expressed needs of most and least successful industrial arts teachers.

Findings and conclusions: The Edwards Personal Preference Schedule does tend to differentiate between the most and least successful industrial arts teachers who formed the population of this study.

4256. MOSS, JEROME, JR. *An Experimental Study of the Relative Effectiveness of the Direct-Detailed and the Directed-Discovery Methods of Teaching Letterpress Imposition.* Ed. D. 1960, University of Illinois. 280 p. L. (Urbana)*

Purpose of study: To provide experimental evidence as to the relative effectiveness of two methods of verbal presentation for introducing meaningful, technical, nonmanipulative material to groups of students.

Source of data and method of study: 106 vocational-industrial students, divided into treatment and IQ level subgroups, equated on nine pre-experimental characteristics, received a lesson containing identical content by two methods differing in the amount and kind of teacher guidance provided. Criterion tests of initial learning, retention, and transfer were administered over a 6-week period. Treatments by levels analysis of variance design were employed.

Findings and conclusions: The direct-detailed and the directed-discovery methods were found equally effective as measured by tests of initial learning, for 1-week and 6-week retention, and for 1-week and 6-week transfer. No interaction of method and IQ level was found.

4257. PENNY, FOREST LEE. *Origin and Development of Industrial Education in Kansas.* Ed. D. 1960, Uni-

versity of Missouri, 302 p. L. (Columbia)*

Purpose of study: To bring together and present in a systematic form the essential facts concerning the origin and development of industrial education in the State of Kansas, and thus assist in clarifying the thinking of teachers, supervisors, school administrators, and laymen as to the nature and purpose of the various industrial education programs.

Source of data: Data were secured through historical research, interview, letter, and questionnaire techniques.

Findings and conclusions: The oldest form of industrial education in Kansas was a trade program for Indians at the Shawnee Manual Labor School opened in 1838. Apprenticeship training was organized by Territorial Law in 1855. In 1942 the State Apprenticeship Council was organized. Schools for teaching trades were organized for the blind in 1859, for the sighted in 1873, and for the deaf in 1887. Reimbursable trade programs were begun in 1917.

Part-time cooperative education needs to be expanded. Related trade extension programs need to be improved. After World War I, 537 veterans took vocational rehabilitation training in Kansas, and following World War II 87,700 veterans were trained on four levels in the State. Industrial arts was begun in the secondary schools at Fort Scott in 1899. Currently there is a trend away from woodworking and toward other areas of instruction in industrial arts. Standards are lacking in industrial arts curricula.

Kansas State Teachers College, Pittsburg, was organized in 1903 to train industrial arts teachers. Kansas has 9 senior colleges and 14 public and denominational junior colleges offering industrial teacher education. Certification and development of satisfactory curricula for training teachers in industrial arts, trade subjects, and cooperative programs need to be studied.

4258. POWERS, G. PAT. *Relationship of Scholastic Attainment to Rated Success of Experienced Industrial Arts Teachers.* Ed. D. 1961, University of Missouri, 106 p. L. (Columbia)*

Purpose of study: To ascertain the relationship between marks earned in undergraduate industrial arts teacher education programs and subsequent success as an industrial arts teacher with 10 years or more teaching experience.

Source of data and method of study: Data on scholastic attainment were obtained from official records of 43 colleges in 25 States for 200 industrial arts teachers who were teaching in 16 States. Ratings on teaching success were obtained from qualified industrial arts supervisors. Correlation techniques were used in handling the data.

Findings and conclusions: A substantial positive correlation was found to exist between rated success of experienced industrial arts teachers and college marks earned in the following areas: professional courses in education (.51); academic courses (.52); all undergraduate courses (.51). A low, but positive correlation (.32) was found between rated teaching success and marks earned in technical courses in industrial arts.

High scholastic marks taken alone provide little guarantee of success as a teacher. Other factors, in addition to scholastic attainment, operate to produce successful industrial arts teachers.

4259. ROWLETT, JOHN D. *An Experimental Comparison of Direct-Detailed and Directed-Discovery Methods of Teaching Orthographic Projection Principles and Skills.* Ed. D. 1960, University of Illinois, 230 p. L. (Urbana)*

Purposes of study: To compare the effectiveness of two selected methods of instruction as measured by initial learning, retention, and transfer in a learning situation involving problem-solving with meaningful materials. The experiment was designed, in addition, to test for interaction between teaching methods and high, average, and low ability levels.

Source of data: The directed-discovery method, a method involving leading questions and "hints" was contrasted with a direct-detailed procedure involving highly specific instruction. Orthographic projection principles and skills were used as the learning task.

The sample used in this study consisted of 168 ninth grade boys and girls. Seventy-two received directed-discovery instruction, and 72 were instructed by the direct-detailed method. A control group of 24 subjects received no instruction but took the 5 criterion tests. The direct-detailed and directed-discovery groups were each composed of 36 boys and 36 girls representing the three ability levels. The control group was composed of 12 boys and 12 girls representing the three ability levels.

Three testing periods were used during the experiment. Immediately following instruction the subjects completed a 50-minute initial learning test. Twelve days after treatment they were given a 50-minute retention and a 50-minute transfer test. Six weeks after treatment the retention and transfer tests were again administered.

Findings and conclusions: The direct-detailed and the directed-discovery methods are equally effective in regard to the initial learning of orthographic projection principles and skills.

The directed-discovery method is superior to the direct-detailed method (*a*) with reference to the retention and application of orthographic projection principles and skills as measured 12 days after instruction; (*b*) with regard to transferring projection principles and skills as measured 12 days after treatment; (*c*) in terms of the retention and application of orthographic projection principles and skills as measured 6 weeks after instruction; (*d*) with respect to transferring projection principles and skills as measured 6 weeks after treatment.

There is no interaction between teaching methods and ability levels.

4260. SCHANBACHER, EUGENE MURRY. *Identification and Analysis of Elements Versus the Conventional Approach in Teaching Drafting.* Ed. D. 1961, University of Missouri, 160 p. L. (Columbia)*

Purpose of study: To ascertain the relative effectiveness of teaching beginning drafting by identification and analysis of elements versus the conventional approach.

Source of data and method of study: Data for the study were obtained by an experimental comparison of the two approaches. This study involved 80 students taught by 2 teachers and ran for 12 weeks. Statistically significant difference was ascertained by the analysis of co-variance technique with high school scholastic average being the control factor.

Findings and conclusions: The teaching of beginning drafting by the identification and analysis approach appears to be more effective than the conventional approach with respect to number of correctly and accurately solved sketching problems. The identification and analysis approach and the conventional approach to the teaching of beginning drafting are about equally effective with respect to informational achievement, quality and quantity of drawing, attitude of students toward the course, and ability to solve sketching problems. In general, one approach is about as effective or desirable as the other. However, it is probable that some teachers can teach more effectively using the identification and analysis approach, whereas other teachers can teach more effectively using the conventional approach.

4261. SCHERER, HARLAN LEONARD. *Procedures and Factors Involved in the Selection of Industrial Arts Teachers and Their Relationship to Rated Teaching Success.* Ed. D. 1960, University of Missouri, 195 p. L. (Columbia)*

Purposes of study: To ascertain the selection procedures and factors employed by school administrators when selecting industrial arts teachers and to evaluate the selection procedures and factors by the subsequent rated teaching success of the teachers selected.

Source of data and method of study: Data utilized in the study were obtained from information forms sent to school superintendents, personnel officers, industrial arts supervisors, and school principals. The selection procedures and factors were obtained from individuals responsible for the selection of the industrial arts teacher and the subsequent success was rated by the teacher's immediate supervisor, namely, his principal. Chi-Square tests were applied to data to determine levels of confidence.

Findings and conclusions: The majority of respondents usually or always held personal interviews, required applicants to submit transcripts of credit, required proof of legal certification, required applicants to fill out formal application blank, and collected information and opinions from persons named as references.

More than 50 percent of the school systems would not consider further an industrial arts candidate if he were not acceptable on: (1) recommendations from teacher education institutions; (2) recommendations from former school officials; (3) personality; (4) health; and (5) professional attitude.

Teachers with graduate credit were rated significantly higher than teachers with no graduate credit.

Few statistically significant differences were found to exist between selection procedures and factors employed in the selection of industrial arts teachers and the subsequent teaching success of those teachers selected.

4262. SHAFER, CARL IVAN. *A Study of the Evaluative Practices in Management Education and Development Programs in Selected United States Industries.* Ed. D. 1961, Michigan State University, 130 p. L. (East Lansing)*

Purpose of study: To study the theoretical aspects and the practices of evaluation of formal management education and development programs in industry.

Source of data and method of study: The theoretical aspects of educational evaluation were synthesized from the literature of edu-

cation, psychology, and business. Major published evaluative research was reviewed and analyzed. A survey of evaluative practices was made by sending a detailed questionnaire to 158 large companies. 74.6 percent of the questionnaires were returned and revealed the current practices of evaluation of management training programs in the selected industries.

Findings and conclusions: Slightly over half of the training departments of companies represented in the survey spend 1 to 5 percent of their *time* on evaluation of their management training programs. Rarely do they spend more than 10 percent of their time on evaluation. Nearly all companies that responded spent 5 percent or less of their training *budget* on evaluation. Evaluation effort, in terms of time and budget, appeared to be greater in companies where top management stresses the evaluation of management training programs as compared to those where top management shows little or no interest in evaluation of management training. The major deterrent to effective evaluation indicated by respondents was that evaluation research techniques were difficult to apply in productive situations. It was also found that the research techniques which are available are inadequate and are too likely to be influenced by variables and other factors in an industrial situation. The study showed the selected companies are engaged, at least to some extent, in effective evaluation activities and are somewhat cognisant of what effective evaluation includes.

4263. SHEMICK, JOHN MAGNUSEN. *Evaluating Initiative and Self-Reliance in Industrial Arts Classes.* Ed. D. 1960, University of Illinois, 136 p. L. (Urbana)*

Purpose of study: To develop and test a self-administered, forced-choice inventory for evaluating initiative and self-reliance in a high school industrial arts class.

Source of data and method of study: An observation scale was developed, and was used to rate 182 high school industrial arts students' initiative and self-reliance while in industrial arts classes. These ratings served as criterion scores upon which the forced-choice instrument was developed. The forced-choice inventory was validated with a new group of 75 students who had been rated through observation.

Findings and conclusions: The coefficients of correlation between observation ratings and forced-choice inventory ratings ranged from —.02 to .15. None of these was statistically significant.

It was concluded that the forced-choice, self-administered inventory, as developed, was not valid for evaluating initiative and self-reliance in industrial arts classes.

4264. SHOEMAKER, CHARLES E. *Instructional Materials in Industrial Arts; An Appraisal of Instructional Materials Prepared by Industry for Home-Use Equipment for Use in Industrial Arts.* Ed. D. 1961, University of Maryland, 154 p. L. (College Park)*

Purposes of study: To appraise instructional material prepared by industry for home-use equipment and to ascertain the appropriateness of these printed instructions as teaching materials for industrial arts.

Source of data and method of study: Samples of 221 instructional materials consisting of printed directions for 34 products used in and about the home were analyzed in the study. The analysis consisted of a description of the samples for each product line according to the principles of layout, typography, content and organization, and methods of illustration. In addition, the materials were appraised by an instrument consisting of 45 items selected by a dual jury of professors from the fields of industrial arts and home economics. Each item or statement identified a characteristic of instructional material that would make the printed materials of value for utilization in industrial arts.

Findings and conclusions: Instructional materials for home-use equipment were found to be inappropriate for general use in industrial arts. However, there were samples of printed materials that were rated on the upper scale of value which indicated the availability of better samples in each product line. The study disclosed that the booklet type of materials was the major style of the industries represented. The printed materials varied in readability level from the 7th to the 8th grade through the 11th and 12th as measured by the Dale-Chall Formula. Major shortcomings of the materials were lack of safety instructions, lack of specific references to illustrations and explanation of how equipment functions, and failure to identify incorrect functions of equipment in case of difficulties in operation.

4265. SWAENGSUGDI, THANOO. *A Study of the Educational Programs of Thai Students in the United States Under the Sponsorship of the International Cooperation Administration During the 1958–1959 Academic Year.* Ed D. 1960, Wayne State University, 259 p. L. (Detroit, Mich.)*

Purposes of study: To investigate social and cultural experiences of participants; ascertain attitudes of participants toward their educational programs; evaluate certain educational experiences; identify opinions of participants regarding potential applications of educational experiences; and study specific problems encountered by the participants.

Source of data: Data were obtained from 190 completed survey instruments that were originally sent to 204 persons under the direct sponsorship of the International Cooperation Administration on five university contracts: two at Indiana University and one each at Oregon State College, The University of Texas, and Wayne State University.

Findings and conclusions: The average participant has been, at least once, a guest in an American home, a visitor in a church, and a speaker before American groups on Thailand and its culture. A considerable number of participants belonged to professional organizations, but only a few were active in social groups. They have visited an average of 10 States each, more frequently in the eastern part of the United States.

Participants reported that they were satisfied with their educational programs. To a considerable degree they felt that their educational experiences could be applied to situations in Thailand. Application would be concerned with improving work situations, teaching at the college level, improving administration, and doing research. They believed that experiences in the United States would help them qualify for promotion and enjoy social distinction.

Participants recognized that they had difficulties with their studies because of inadequate competency in English. This was especially true during the early phase of their experiences in the United States. There was a minor problem in adjusting to living conditions, such as food and climate, but they did not regard this as serious. Eventually, most became well adjusted to living conditions in the United States.

4266. WOCKENFUSS, WILLIAM ARTHUR. *Sociological Bases of Industrial Arts for Secondary Schools.* Ed. D. 1960, University of Florida, 480 p. L. (Gainesville)*

Purpose of study: To propose a conceptual basis for developing an industrial arts program. The major hypothesis: bases of the industrial arts program are sociological rather than narrowly technological.

Source of data and method of study: Data were gathered through an analysis of major authoritative writings on demography, social morphology, social processes, social institutions, and social change. Significant facts were drawn from major writings and applied to industrial arts education. Implications were synthesized into guiding principles for the development of an industrial arts program consonant with the sociological bases upon which it must rest.

Findings and conclusions: As a field of specialization, industrial arts must continue the study of tools, materials, processes, and products of industry. In addition, it must help students to understand (1) industry as a social institution; (2) the occupations of industry; (3) health and safety practices of industry; and (4) industrial labor relations.

4267. VANTRUMP, WILLIAM FREDERICK. *Duties, Competencies and Opportunities for Trained Licensed Practical Nurses Working in the Hospitals of Missouri.* Ed. D. 1961, University of Missouri, 153 p. L. (Columbia)*

Purpose of study: To determine the practice of Missouri hospitals in the use of trained licensed practical nurses, the competency of such nurses in the performance of their duties, and the present and future employment opportunities in the vocation.

Source of data and method of study: Hospital administrators supplied data concerning hospital facilities, personnel policies, staff, and future plans. Supervisors rated the duties and competencies of their subordinates. The trained licensed practical nurses supplied personal information concerning their own employment, duties, and competency.

Findings and conclusions: Seven hundred and twenty-three trained licensed practical nurses were identified as working in Missouri hospitals. Over 95 percent were doing bedside nursing. There was an immediate need for an additional 700 and a 3-year projected need of an additional 1,100. Trained licensed practical nurses were caring for both the mildly and critically ill patient with no apparent differentiation, as only 3 of the 50 duties showed a significant difference. Supervisors rated trained licensed practical nurses higher in competency than the nurses rated themselves. Schools of practical nursing should place greater emphasis on teaching and perfecting the more frequently performed nursing skills. Salaries throughout the State were too low to attract desirable trainees in sufficient quantities to meet employment needs.

4268. WOLD, KENNETH MANVIL. *Practices Employed in Selecting Students for Technical Curricula and Their Relation to the Student Completion Rate.* Ed. D. 1961, Univer-

sity of Missouri, 270 p. L. (Columbia)*

Purpose of study: To ascertain practices employed in selecting students for technical (engineering-related) curricula in institutions which offer technical programs and the relation of these practices to the student completion rate.

Source of data and method of study: Data were obtained from information forms completed by 129 public and 40 private school representatives. The Chi-Square test was used for the statistical treatment of data.

Findings and conclusions: Entrance into technical curricula in most schools was to be based on one or several of the following requirements: high school graduation or its equivalent; average high school grade; and prerequisite courses in English, algebra, and plane geometry.

There was no statistically significant relationship between student completion rate in technical curricula and the following: entrance requirements, selection methods and devices, type of school control, and whether or not the school was accredited by the Engineering Council for Professional Development.

Applicants generally attracted to technical curricula were below the caliber capable of completing such curricular successfully. Applicants were not well oriented regarding their personal qualifications and the qualifications required for entrance into technical curricula.

4269. WOOLDRIDGE, ROBERT ELMO. *Employment Opportunities and Training Needs for Technicians in the State of Washington with Projections to 1970.* Ed. D. 1961, University of Missouri, 116 p. L. (Columbia)*

Purpose of study: To compare the probable supply of, and demand for, technicians in the State of Washington from 1960 to 1970, and to interpret the implications of these findings for vocational-technical education.

Source of data and method of study: Data were obtained from publications of various agencies of the governments of the United States and the State of Washington. The employment opportunities for technicians in Washington were estimated from projections of total employment.

Findings and conclusions: The number of technicians employed in the State of Washington in 1960 was estimated at 6,873; this number is expected to increase to 13,352 in 1970. The number of employment opportunities for technicians is expected to be 7,723 during the 1960–70 decade, with the largest number expected in the manufacture of transportation equipment.

Vocational-technical schools and junior colleges of the State of Washington are expected to train 5,001 technicians during the 1960–70 decade. An excess of 2,726 employment opportunities over training opportunities for technicians is expected during the 1960–70 decade.

More vocational-technical training opportunities are needed for the people of the State of Washington; technicians can look forward to high levels of employment in most of the manufacturing industries; and it is apparent that technicians are playing an increasingly important role in Washington's industries.

Master's Studies

4270. BERLIN, THEODORE JOHN. *Welding in the Junior High School.* M.A. 1961, The Ohio State University, 68 p. L. (Columbus)

Purpose of study: To determine the status and reasons for such status of welding in the junior high school industrial arts curriculum.

Source of data and method of study: A questionnaire was sent to 68 selected school systems in cities of 100,000 population or more which were assumed to have city supervisors of industrial arts.

Findings and conclusions: Welding was included in the junior high school curriculum in only 32 percent of the school systems samples. The major emphasis on welding was on the ninth-grade level with gas welding used most often followed closely by arc welding and spot welding, respectively. No welding was found on the seventh-grade level.

Thirty-seven percent of the school systems stated that they believed welding was an appropriate curriculum area in the junior high school; 54 percent thought that it was not an appropriate curriculum area.

The major reason for including welding in the curriculum was that it is a modern fabricating process. Two other important reasons for including welding in the junior high school were for demonstration purposes and for fabricating projects.

The major reasons for not including welding in the curriculum were the immaturity of the students followed by safety factors, costs of supplies and equipment, the relative importance of welding as compared with other industrial arts areas, the limited time available, and the relative importance of welding as compared with other metalworking areas in that order.

4271. BONAWITZ, ROBERT LEE. *The Educational Needs of a Manual Arts Therapist.* M.A. 1960, University of Minnesota, 79 p. Department of Industrial Education (Minneapolis)

Purposes of study: To examine clinical training programs conducted in Veterans Administration hospitals; to obtain opinions of the chief manual arts therapist at these hospitals as to the type of courses thought valuable to individuals interested in this profession; and to propose an outline of undergraduate courses which would help prepare future manual arts therapists.

Source of data and method of study: Literature pertinent to the field of manual arts therapy was analyzed. Also, a questionnaire was sent to the chief manual arts therapist in 90 Veterans Administration hospitals.

Findings and conclusions: Most chief manual arts therapists felt that there was a need for a curriculum in manual arts therapy and that it should include some courses dealing with rehabilitation, anatomy, and psychology as well as the industrial arts education program.

4272. BOONE, RICHARD MARSHALL. *Andrew H. Whitesitt and His Contributions to Industrial Education.* M.S. 1961, Kansas State Teachers College. 68 p. L. (Pittsburg)

Purpose of study: The purpose of this study was to examine the contributions of Andrew H. Whitesitt to the field of industrial education.

Source of data and method of study: Personal interviews with Mrs. A. H. Whitesitt, their sons, and other persons who worked directly with Professor Whitesitt during his tenure at Kansas State Teachers College. All readily available, pertinent literature was reviewed to lend further support to the study.

Findings and conclusions: This study gives insight into the incentives, perseverance, and value of the work and character of Andrew H. Whitesitt. His philosophy and contributions made a definite mark on industrial education and its growth and development throughout this country during the first half of this century, especially while he was head of the Department of Industrial Education at Pittsburg.

4273. BOWDEN, WILLIE CLARENCE. *A Survey of Course Offerings in Industrial Arts in the Negro Public Junior and Senior High Schools of Georgia During the Year 1959–60.* M.A. 1960, University of Minnesota. 89 p. Department of Industrial Education (Minneapolis)

Purposes of study: To determine the content of courses in industrial arts programs in the Negro junior and senior high schools in Georgia during the year 1959–60; to determine the adequacy of facilities; to study the industrial and educational trends of Georgia and their impact on industrial arts; to formu-

late a philosophy of industrial arts; and to present some industrial arts trends.

Source of data and method of study: Data were obtained from the Georgia Educational Directory, 1959–60 and Negro industrial arts teachers in the State of Georgia. The questionnaire method was used.

Findings and conclusions: Offerings were limited to 15 subject areas taught in 43 schools by 51 teachers. Woodwork was taught in 54 percent of the classes. There were sufficient supplies, materials, hand tools, and machines in the majority of the schools. Storage space was limited. The auxiliary rooms needed were: (1) Dustproof finishing rooms, (2) planning rooms, (3) shop libraries, (4) office and conference areas, and (5) washrooms. A greater variety of subject areas and more provisions for audiovisual aids were needed. Industrial arts should be required 1 year for all boys and all schools should provide elective courses for girls.

4274. BROCK, WHEELER EAGLE. *Development and Status of Vocational Education and Practical Arts in Calcasieu Parish*, 1714–1957. M.S. 1960, Northwestern State College, 117 p. L. (Natchitoches, La.)

Purpose of study: To collect and assemble information on the total program of vocational education and practical arts in Calcasieu Parish.

Source of data and method of study: Data were secured through questionnaires, personal interviews, library references, statistical records, and office records of Calcasieu Parish Superintendent and Lake Charles City Superintendent of Schools.

Findings and conclusions: School administrators should become better acquainted with vocational education; a plan for pupil transportation is needed; a more accurate system of follow-up should be universally adopted; more emphasis should be placed upon student placement; instructors should spend at least 1 summer out of every 3 working at their trade in industry; facilities for Negro students need to be increased; entrance requirements into vocational classes need to be raised; a better public relations program is needed; a plan to reduce drop-outs needs to be developed; and a vocational school coordinator needs to be a qualified guidance counselor as well.

4275. BRYDLE, JOHN ROBERT. *Analysis of Major Electronics Technician Training Problems Encountered by Leading Electronics Systems Manufacturers in the United States.* M. Ed. 1960, Wayne State University, 33 p. Department of Industrial Education (Detroit, Mich.)

Purpose of study: To collect and analyse the major technical training problems of commercial organizations offering electronic technician training programs.

Source of data and method of study: A questionnaire sent to 50 leading electronics systems manufacturers in the United States.

Findings and conclusions: The 10 leading problems revealed by 16 respondents were analyzed on the basis of the writer's experience in this training field as follows:

Students often lacked a good foundation in mathematics and basic sciences.

There was too little time to train instructors on both the theoretical and practical aspects of the equipment they taught.

Technical manuals were inadequate for training.

It was difficult to obtain enough laboratory equipment.

There was a shortage of instructors.

There was too little time to train instructors in techniques of teaching.

Better tests of students' practical ability to maintain equipment were needed.

Training supervisors were not in close personal contact with training problems and could not keep themselves up to date technically on the new equipment being taught.

Some students took their work too lightly.

Some instructors needed more field experience on the equipment they taught.

4276. BUTTERY, WILLIAM ALBERT. *Component Building Systems with Implications for Industrial Arts Teachers of Drafting.* M.A. 1960, University of Minnesota, 118 p. Department of Industrial Education (Minneapolis)

Purposes of study: To analyze, explain, and describe a method of house panelization adopted by individual erectors, contractors, or carpenters, and to define and describe the training and activities of technicians employed in component building systems.

Source of data and method of study: The source of the data of the component system was the manufacturing operation at a lumber company at Darlington, Wis. Through an analysis of methods and materials used, the practices described were selected. The method of study involved the observation of procedures used in the operation, describing the advantages and disadvantages of each, and recording facts justifying the methods.

Findings and conclusions: Considerable survey work indicated that there were many component building systems in active production. Leaders in the housing field predict that component panel practices will increase rapidly.

It was concluded that industrial arts teachers would have to respond to the changes and base some phases of architectural drafting on the implications of the panelization trend and building.

4277. CAMPBELL CHARLES ALVIN. *A Study of the In-Plant Training Programs in Kansas.* M.S. 1961, Kansas State Teachers College, 37 p. L. (Pittsburg)

Purpose of study: To gain a general knowledge concerning the organization and administration of in-plant training programs in Kansas industries.

Source of data and method of study: The method of study was of a descriptive nature and data were obtained from a review of literature, personal letters from industrial personnel, and from a questionnaire sent to 100 Kansas industries.

Findings and conclusions: It was found there was a wide range of in-plant training programs operated by the various industries. Each plant, because of the nature of its work, was responsible for this variation in training programs. Of the eight basic training programs identified for this study, on-the-job training was most used by the companies contacted.

4278. CASPER, VINCENT FRANCIS. *Original Creativeness, Patents, and the Industrial Arts Teacher of Missouri.* M.A. 1960, Northeast Missouri State Teachers College, 77 p. L. (Kirksville)

Purposes of study: To ascertain what approaches to the development of creativeness in industrial activities have been suggested by authorities; to ascertain if the industrial arts teachers of Missouri patent their original ideas; and to determine whether a short unit on patents and patent procedure would be of value in industrial education classes.

Source of data and method of study: Data were secured from periodicals, books, government pamphlets, and an information form sent to all full-time industrial arts teachers in Missouri.

Findings and conclusions: Very little has been achieved in the industrial arts field relative to original creativeness. Thirty-five percent of the industrial arts teachers of Missouri thought they had patentable ideas; however, only 5 percent did patent their ideas. Sixty-six percent thought that a short unit on original creativeness, patents, and patent procedure would be of value. The mechanical drawing class in the eleventh or twelfth grade was the suggested place for the unit. Teachers also stated that original creativeness should be stressed in both elementary and secondary school.

4279. CHANEY, ROGER LEWIS. *Electric Welding: A Resource Unit for Industrial Arts Teachers.* M.A. 1961, The Ohio State University, 245 p. L. (Columbus)

Purpose of study: To provide industrial arts teachers with a resource unit on electric welding.

Source of data and method of study: Data were taken from textbooks, technical books and journals, industrial publications, and catalogs. The personal industrial experience of the writer was also used where needed. The study was limited to the welding processes using electrical energy as a source of heat.

Findings and conclusions: The study was not concerned with "findings," therefore none were given. The recommendation that a future study be made of all available resource units for the purpose of making better use of such existing material was formulated.

4280. CLIME, MAX EDWARD. *Relationship of a Standard Achievement Score to Achievement in Industrial Arts.* M.A. 1960, Northeast Missouri State Teachers College, 49 p. L. (Kirksville)

Purpose of study: To ascertain relationships between a student's Standard Achievement score and his achievement in woodworking, mechanical drawing, and metalworking in the eighth-grade industrial arts program at Washington Junior High School, Ottumwa, Iowa.

Source of data and method of study: All the eighth-grade industrial arts students between the school years of 1956–56 and 1958–59 were listed. Each student's permanent record was checked, and if the student had completed the industrial arts program and had taken the Stanford Achievement Test, he was given a case number for this study. Three groups were made from these students and Linear Correlations were worked to indicate the relationships of the Stanford Achievement Test score to industrial arts achievement in woodworking, mechanical drawing, and metalworking.

Findings and conclusions: All correlations between Stanford Achievement Test scores and industrial arts achievement in this study were

low. Factors other than those measured by the standardized test operate to achieve success or failure in industrial arts courses at Washington Junior High School.

4281. COCHRAN, CARL CLIFTON. *Student Teachers' Training Activities in Industrial Arts For Off-Campus Programs of Northeast Missouri State Teachers College.* M.A. 1960, Northeast Missouri State Teachers College, 125 p. L. (Kirksville)

Purposes of study: To survey practices of industrial arts, student-teacher activities in off-campus programs, and compile helpful suggestions and recommendations for a richer and more wholesome student-teacher experience on the part of industrial arts majors at Northeast Missouri State Teachers College.

Source of data and method of study: Data were obtained from selected reference books, periodicals, conference reports, and bulletins obtained from State Departments of Education and teacher-training institutions. From this material information was compiled, suggestions made, and recommendations submitted.

Findings and conclusions: Supervising teachers share with the college faculty a need for understandings, skills, and attitudes which make for effective guidance and learning experiences for student-teachers. More emphasis needs to be placed on acquainting the student-teacher with the teaching situation. The supervising teacher should use a wide variety of teaching materials and at the same time present a practical and true picture of teaching.

A student-teacher's readiness to teach will be reflected in all phases of training. The student-teacher should become aware of the teacher's responsibilities early in his college career.

Observation was considered an inherent part of the student's professional development. A more uniform control of the teaching phase of training was needed. Evaluation and guidance should be continuous as the student progresses in training and should serve as a measure for the student's accomplishments.

4282. CONTORAVDIS, SPYROS. *A Proposed Curriculum for the Preparation of Television Technicians in Greece.* M.S. 1960, Stout State College, 78 p. L. (Menomonie, Wis.)

Purpose of study: To develop a curriculum for the preparation of television technicians to be trained by the Sivitanideos Technical School at Athens, Greece.

Source of data and method of study: The normative survey method of scientific research, together with documentary frequency, observation, and interview techniques. Information was obtained about vocational education in Greece and about television curricula in seven selected technical schools of the United States.

Findings and conclusions: A curriculum for the training of television technicians and outlines for each particular course in the curriculum were presented in the study. Curricular innovations recommended for improving vocational education in Greece are: Procedures for curriculum reconstruction, improvement of testing methods, addition of nontechnical courses, and inservice training for the teaching staff.

4283. COX, JAMES HOWARD. *Curricular Needs of Junior High School Students in Des Moines, Iowa Public School System.* M. Ed. 1960, Iowa State University, 32 p. L. (Ames)

Purpose of study: To determine the curricular needs of male junior high school industrial arts students in the planning and drawing area.

Source of data and method of study: Data were secured through a questionnaire and a personal interview with 33 industrial arts teachers in the city of Des Moines, Iowa, during the school year 1959–60.

Findings and conclusions: The needs mentioned most frequently as being most important were: To read working drawings; to make and read freehand shop sketches; to learn to use and care for drawing equipment and materials; to learn how to plan a project; to learn about the importance of drawing in industry and life situations; and to study and make orthographic drawings.

4284. CROFT, WILLIE WAYNE. *Opinions of Selected Industrial Arts Teachers Concerning Desirable Content For a General Shop Instructional Guide.* M.A. 1960, Northeast Missouri State Teachers College, 76 p. L. (Kirksville)

Purpose of study: To determine what industrial arts teachers of Missouri considered most useful to them in a State General Shop Course of Study Guide.

Source of data and method of study: Data were gathered by a normative survey of general shop teachers of Missouri. The State Department of Education and the Industrial Education Department of the Northeast Missouri State Teachers College selected the group of general shop teachers for this survey.

Findings and conclusions: Information supplied by the respondents to this study indicated a definite need for a General Shop Course of Study Guide planned on a State level. Items considered important and useful in a guide were: Statement of objectives; shop plans and layout; tool and equipment lists; detailed list of suggested manipulative activities; list of related information topics; suggested teaching plan on a weekly basis; information assignment sheets; information pertaining to problem-solving, experimentation activities and creativity development; project plans; sources of teaching aids; student evaluation sheets; and sample tests.

4285. CROWDER, JIMMIE CHARLES. *Technical Occupations in Shreveport Metropolitan Area in Louisiana with Implications for Technical Education.* M.S. 1960, Northwestern State College, 97 p. L. (Natchitoches, La.)

Purpose of study: To obtain the types of specialized training and the general education needed by technicians employed in Caddo Parish industries with specific reference to: Information concerning technicians and firms; job descriptions and work activities of technicians; related technical information used by technicians; present and future need for more technicians.

Source of data and method of study: Data were obtained from books, news items, unpublished materials, a questionnaire, periodicals, and personal interviews.

Findings and conclusions: It was concluded that a common core of experiences and related technical information for all industrial technical training programs should include:

Engineering drawing or technical drafting—using engineering and technical manuals; making sketches and working drawings; plotting curves and graphs; recording and compiling data; reading and writing technical reports; making scale drawings; and taking details from master designs.

Industrial equipment—testing and adjusting equipment; repairing equipment; adapting equipment to new needs; and operating and maintaining equipment.

Industrial instruments—inspecting and trouble-shooting with instruments; and making computations from instruments.

Mathematics—laying out work; calculating angles and forces; interpreting drawings; drafting; using slide rule; computing angles, shapes, and ratios; using proportions; interpreting reports; evaluating materials; and solving formulas.

Science—functions of steel as related to welding; using ammeters and voltmeters; using electrical theory in circuitry motors and solenoids; and electrical maintenance.

4286. DIGNAN, RICHARD JAMES. *A Followup Study of Voluntary Withdrawals from Stout State College for the School Year 1958–1959.* M.S. 1960, Stout State College, 70 p. L. (Menomonie, Wis.)

Purpose of study: To provide factual evidence concerning voluntary student mortality at the college.

Source of data and method of study: A checklist was mailed to each voluntary withdrawee to learn the reasons that students give for leaving college. Permanent records on file in the Registrar's Office and the Student Personnel Office were surveyed for data which would give added information concerning causes for withdrawal.

Findings and conclusions: This study revealed that 189 students voluntarily withdrew from Stout State College during the 1958–59 college year. Approximately one-third of these students transferred to other colleges. Over half of those who transferred changed their vocational objective. Financial difficulty and marriage were the biggest single factors causing students to discontinue their education.

4287. ENGELHARDT, JOHN WILLIAM. *Supplemental Activities and Income of Industrial Arts Teachers of Louisiana.* M.S. 1960, Northwestern State College, 51 p. L. (Natchitoches, La.)

Purpose of study: To ascertain the preparation, experience, and supplemental activities and income of white industrial arts teachers in Louisiana.

Source of data and method of study: Data were obtained by mailing questionnaires to all white industrial arts teachers listed in the official State School Directory of Louisiana.

Findings and conclusions: Sixty percent of the industrial arts teachers included in this study did extra work to supplement their incomes. Skills and knowledge acquired in college industrial arts studies were helpful in supplementary work. A majority of the teachers believed supplementary employment had a beneficial effect on their teaching. About one-third of the teachers did not feel the supplementary work made them a more capable teacher. Many industrial arts teachers indicated the only reason they were doing extra work was because of the need to supplement their teaching salaries and several teachers indicated they would quit supplementary work if their salaries were increased.

4288. EVANS, DALE WESLEY. *A Program for Industrial Arts with Special Reference to the South-Western City School District, Franklin, County, Ohio.* M. A. 1961, The Ohio State University, 93 p. L. (Columbus)

Purpose of study: To ascertain ways to improve the industrial arts program throughout the South-Western City School District.

Source of data and method of study: Documentary data were used.

Findings and conclusions: Improvement can be achieved by: coordinating the programs, adjusting emphases of instructional areas, utilizing facilities to better advantage, and acquiring additional space.

4289. FLADELAND, SIDNEY. *The Impact on a Skilled Labor Force Resulting from the Introduction of Jet-Propelled Aircraft by the Scheduled Domestic Airlines of the United States.* M. A. 1959, University of Minnesota, 77 p. Department of Industrial Education (Minneapolis)

Purpose of study: To ascertain the approximate number of students who will need aircraft mechanical training in the next decade.

Source of data and method of study: Data were obtained from the United States Department of Commerce Civil Aeronautics Administration, Air Transport Association of America, and Northwest Orient Airlines and by reviewing the history of commercial aviation, current literature, and reports by air carriers, together with interviews with airline officials and labor leaders.

Findings and conclusions: Jet aircraft, although requiring less maintenance in proportion to their work capacity than the older aircraft, can be expected to attract enough new customers to assure a continued demand for trained aircraft mechanics. The number needed in the next decade will be an additional 60 percent, or about 17,000. An annual turnover of 8 percent will require another 2,000 to 3,000 each year, or about 30,000 in 10 years. Mechanics in the future will require more technical training.

4290. GEIMER, (*Brother*) JOEL NICHOLAS. *Industrial Arts Program for Schools of the Christian Brothers of the St. Louis District.* M. A. 1960, University of Minnesota, 165 p. Department of Industrial Education (Minneapolis)

Purpose of study: To develop a suggested program for industrial arts education for use in the schools conducted by the Christian Brothers of the St. Louis District.

Source of data and method of study: Desirable features of the industrial arts programs already used in the Brothers' schools were identified by interviewing the principals and administering questionnaires to the industrial arts teachers and selected students. Recommendations for industrial arts in public schools were considered by examining bulletins on industrial arts education published by State departments in the States in which the Brothers' schools were located.

Findings and conclusions: Objectives for the proposed industrial arts program were suggested and defined. Recommendations were made that: all ninth-graders be required to take a comprehensive industrial arts course, including units in woodworking, general metals, graphic arts, drawing, electricity, and power mechanics; individual industrial arts courses in the above areas be offered in grades 11 and 12 for those students who are interested and able to profit from such instruction; and eleventh- and twelfth-grade courses be taught in limited general shops, or, if necessary, in comprehensive general shops.

4291. HAWKINS, MAX DEAN. *The Life and Contributions of Charles R. Wasser.* M. S. 1961, Kansas State Teachers College. 58 p. L. (Pittsburg)

Purpose of study: To examine the contributions, influences, and effects left by Charles R. Wasser.

Source of data and method of study: This study was limited to the life and contributions of Charles R. Wasser in the field of industrial education. Information was gathered from newspapers, alumni, Graduate News Bulletins, college bulletins, class schedules, and personal interviews.

Findings and conclusions: Professor Wasser's influence will long be evident at Kansas State Teachers College. His contributions are found in the physical plant of the college, the industrial education curriculum, and in the philosophy and teaching methods of many of his former students throughout the Nation.

4292. HORTON, MICHAEL WILLIAM. *The Effectiveness of the Mass-Production Technique in Achieving Selected Objectives for Industrial Arts.* M. A. 1960, Iowa State Teachers College, 110 p. L. (Cedar Falls)

Purpose of study: To determine whether two comparable groups of students will show significant differences in achievement with respect to selected industrial arts objectives when one group is taught by the traditional method and the other is taught, in part, by the mass-production technique.

Source of data and method of study: The achievement of a control group of college students who received traditional instruction was compared with that of an experimental group who did a mass-production job as part of their shop work. Student achievement was measured by a final examination, a questionnaire, and a cooperative attitudes rating scale. The experiment was conducted in the General Woodworking course at Iowa State Teachers College.

Findings and conclusions: The difference in achievement between the two groups on the final examination was found to be insignificant. The major portion of this exam was devoted to shop skills and knowledge. Apparently the shop skills and knowledge required for success in this industrial arts course were learned even when a mass-production job was included in the instructional program. Student responses given on the questionnaire and the results of the cooperative attitudes rating scale indicated that the mass-production work done by the experimental group was a type of activity which was especially suited to the development of an interest in industry and cooperation among the members of the class.

4293. HOSKINS, RICHARD HARWOOD. *The Teaching of Multi-View Drawing with Pictorial Sketching As the Experimental Variable.* M. A. 1960, The Ohio State University, 78 p. L. (Columbus)

Purpose of study: To determine the effect of pictorial drawing knowledge on the acquisition of knowledge related to multi-view drawing and whether IQ. spatial visualization ability, or abstract reasoning ability have any predictive value pertaining to multi-view drawing.

Source of data and method of study: This was an experimental study utilizing the equivalent-groups method There were 20 subjects in each group, equated in terms of IQ scores. The period of instruction was 9 weeks. Pre-post teacher-constructed multi-view drawing tests were administered and analyzed as were two tests from the D.A.T. Battery.

Findings and conclusions: Students who have some knowledge of pictorial sketching show more growth in multi-view drawing than those students who do not have this knowledge of pictorial sketching.

Intelligence scores have some predictive value in relation to multi-view drawing with a correlation coefficient of .67. Spatial visualization ability has little predictive value in relation to multi-view drawing with a correlation coefficient of .36. Abstract reasoning ability has some predictive value in relation to multi-view drawing with a correlation coefficient of .68.

4294. HUFF, ARTHUR STANNIS. *A Study of the Electrical Power Wiring Systems Used in Current School Shop Construction.* M. A. 1961, Northeast Missouri State Teachers College, 74 p. L. (Kirksville)

Purpose of study: To gather information to serve as a basis for arriving at decisions concerning recommendations for the various types of electrical power wiring systems used in current school shop construction.

Source of data and method of study: Data were obtained from textbooks, pamphlets, periodicals, personal contact, and correspondence with industrial arts instructors, experts in the field of school shop planning, power and light specialists, and electrical supply and manufacturing companies. The investigator also visited several new school shops in Missouri, Iowa, and Illinois.

Findings and conclusions: School planners should seriously consider and investigate the use of the overhead duct system. For the initial expense involved, it is the most flexible system available. In the placement of machines it is versatile. A plug-in duct system is completely self-contained and is superior to others in the areas of flexibility, salvability, convenience, and safety. It is installed overhead, in the open, which permits ready repair and alterations. Consideration should also be given to the installation of three-phase circuits for power machines. This can be justified by the use of three-phase motors, smaller conductors, less voltage drop, and a better power factor. Many larger shops, especially colleges, are using an underfloor duct system laid out in a grid pattern. This system is hardly noticeable.

4295. HUFFMAN, PARKE WENDELL. *Evaluating the Slip Resistance of Common Fluid and Floor Materials Used in the Machine Shop.* M.A. 1961, Wayne State University, 71 p. L. (Detroit, Mich.)

Purpose of study: To conduct slip-resistance tests to measure the effects of machine oil, spindle oil, cutting oil, soluble oil, and white lead on the surface resistance of oak wood strip, wood block end grain, and concrete floor surfaces.

Source of data and method of study: Data were taken from pertinent available research literature and from results of the slip-resistance tests made in the machine shops at the Wilbur Wright Cooperative High School.

Findings and conclusions: The action of the rubber- and leather-faced test blocks on the surfaces followed expected patterns in most of the results produced. Data indicated, in a relative way, the degree to which the flooring materials tested differ from one another in surface resistance because of the nature of their surface in the dry state, the nature of the contact surface of the force placed upon them, and the nature of the film of fluid put between their interfaces. Data also indicated to what extent each of these variables contributed to the comparative coefficient of friction.

The study revealed a phenomenon that took place as the test blocks passed from the dry portion of the test strip to the wet portion of the test strip. The action which followed was the basis on which the coefficients of kinetic friction for the study were established, as it revealed the point in time and place where the most accurate conditions prevailed for the objective of the test.

Further study of this problem would be beneficial and necessary to any conclusive recommendations, but the significant findings that were made do have practical application for machine shop safety inasmuch as data produced give a relative value to the surface-resistant qualities of the materials studied and the extent those qualities are altered by the presence of any of the test fluids.

4296. HUTCHINGS, RICHARD SCOTT. *An Industrial Arts Program for the Seventh and Eighth Grades of Worthington, Ohio: A Study of Purposes, Curriculum, and Outcomes.* M.A. 1960, The Ohio State University, 116 p. L. (Columbus)

Purpose of study: To justify a revised industrial arts curriculum based on cultural-technical-vocational interests.

Source of data and method of study: The problem was investigated by using the historical and literary research method to establish the necessity for teaching industrial arts, and a survey instrument was utilized to determine the attitudes of adults and students toward an industrial arts program to reflect technology.

Findings and conclusions: The written research and responses to the questionnaire indicated the validity of the problem. The total responses to the questionnaire pointed out the respondents' desire to help develop a better educational program with special emphasis on industrial arts education.

4297. JOHNSON, CHARLES WILLIAM. *A Study of Emphasizing Time in Teaching Mechanical Drawing.* M.S. 1961, Kansas State Teachers College of Emporia, 135 p. L. (Emporia)

Purpose of study: To ascertain the effect on achievement in beginning mechanical drawing when emphasis was placed on the time element in teaching the subject.

Source of data and method of study: This was an experimental study using 150 seventh-grade beginning mechanical drawing students as subjects. Seventy-five of the students were taught mechanical drawing in the conventional way and 75 were taught with speed emphasized throughout the course.

Findings and conclusions: The conclusions of this experiment were that emphasizing speed increased the average number of drawings done by each student, but the difference in technical information gained or in drawing achievement was not significant.

4298. KEIGHTLEY, ROGER R. *A Comparative Study of Complex Finger Dexterity Ability Among Five Homogeneously Grouped Ninth-Grade Industrial Arts Metalworking Classes at Scottdale Joint High School.* M. A. 1961, West Virginia University, 60 p. L. (Morgantown)

Purpose of study: To investigate and determine relative abilities of students to perform complex finger manipulations.

Source of data and method of study: Scores made on two shopmade manipulative tests were compared with marks made in other school subjects.

Findings and conclusions: Standard deviations computed for test scores for academic ability within groups showed students to be widely dispersed in ability. There was little difference in the test for threading finger dexterity for all groups except Group IV and Group III. Substantially low correlation was found between paper tests of academic ability and complex finger dexterity as measured through the threading finger dexterity test or the tweezer finger dexterity test.

4299. KIMMEL, COY KEITH. *An Analysis of Three-Dimensional Aids Useful in Teaching Applied Electricity.* M. A. 1960, Northeast Missouri State Teachers College, 58 p. L. (Kirksville)

Purposes of study: To ascertain what three-dimensional aids are needed to facilitate in-

struction in a unit course of applied electricity and to determine the source and availability of these aids.

Source of data and method of study: Data were secured from commercial catalogs, applied electricity publications, and periodical literature. The content of the course was determined and an analysis and compilation of aids were made. These aids were then listed according to their use in individual units within the course.

Findings and conclusions: Many useful aids were available from commercial sources. Others could be constructed by buying component parts and assembling teaching aids or by using existing parts and equipment in the shop and assembling these into teaching aids. It was also found that many simple but necessary aids and devices needed to be designed and constructed by the applied electricity instructor.

4300. KINDEL, ERSAL WINTON. *Demonstration Techniques Useful in Teaching High School Electricity.* M.S. 1961, Kansas State Teachers College, 107 p. L. (Pittsburg)

Purpose of study: To discover and develop useful teaching aids which may be built in the school shop.

Source of data and method of study: Materials were gathered from textbooks, project books, periodicals, and other pertinent available literature. Teaching aids were developed and constructed in the shop.

Findings and conclusions: Teaching aids which will illustrate any principle which the teacher presents to his class can be obtained or made as the result of research and imagination.

4301. KING, DALE DONALD. *A Followup Study of Industrial Technology Graduates from Western Michigan University 1955–1959.* M.A. 1960, Western Michigan University, 84 p. L. (Kalamazoo)

Purposes of study: To secure information concerning the employment status of the 1955–59 graduates of the 2-year terminal and the 4-year technical degree curricula at Western Michigan University and to secure suggestions from them as to the improvement of these curricula.

Source of data and method of study: Data were secured through questionnaires returned by a sample of 106 graduates of the department.

Findings and conclusions: Graduates of the 2-year programs made, on the average, approximately the same salary as graduates of the 4-year programs. Graduates indicated a need for more science, mathematics, report writing, and management-type courses.

Industrial supervision (a 4-year program) outranked all other curricula in the percentage of graduates employed in their major field of preparation. Drafting and design (a 2-year program) was second. The majority of the graduates were employed in Michigan, and approximately one out of five was employed in Kalamazoo.

4302. KIRKPATRICK, ELVIS J. *Suggested Units of Instruction for the Power and Transportation Area of the General Shop.* M.A. 1961, Northeast Missouri State Teachers College, 180 p. L. (Kirksville)

Purpose of study: To identify and develop units of instruction that could be recommended for the power and transportation area of the comprehensive general shop for the junior high school.

Source of data and method of study: This study involved an analysis of literature, including publications from State Departments of Education, a survey of selected industrial concerns, an interest survey in two small high schools, and an experiment in teaching selected lessons, to determine both suggested units of instruction and selective criteria which could be used to recommend the suggested units.

Findings and conclusions: Conclusions were presented and a list of suggested units of instruction were recommended for the power and transportation area of the general shop at the junior high school level.

4303. KUMFER, JAMES O. *The Use of an Attitude Scale To Determine Parental Attitudes Toward Certain Objectives of Industrial Arts, Canal Winchester, Ohio.* M.A. 1961, The Ohio State University, 140 p. L. (Columbus)

Purpose of study: To measure parental attitude toward certain selected objectives of industrial arts.

Source of data and method of study: Data were obtained by administering a Likert-Type attitude scale to parents of industrial arts students at Canal Winchester High School, Canal Winchester, Ohio.

Findings and conclusions: Parents of industrial arts students believed that proper safety instruction and proper attitude development should be the two most important objectives of industrial arts courses. They also ranked intelligent consumer knowledge, en-

during leisure-time interest, and awareness of culture as different objectives of industrial arts courses. However, parents questioned whether industrial arts courses should provide training useful in an occupation and whether industrial arts should provide experiences leading to an understanding of industry.

4304. LACY, ROBERT. *A Study of Factors Which Caused the Decline in Total Number of Students Enrolling in the Vocational Schools in the City of St. Louis in the Last Two Years.* M. Ed. 1961, The Ohio State University, 60 p. L. (Columbus)

Purpose of study: To determine some of the reasons for the slow, consistent decline in the total number of students enrolled in vocational education in the city of St. Louis, Mo.

Source of data and method of study: Examination, analysis, and compilation of questionnaires from 200 students form the basis on which the conclusions were drawn and recommendations were made.

Findings and conclusions: It was determined that 112 students had planned to enroll in vocational education, but did not enroll because of the influence of parents, teachers, and friends; for lack of knowledge relative to the program; or because of the idea that employment in the vocations did not offer enough security.

4305. LANDSVERK, DONALD KEITH. *The Utilization of Audiovisual Materials, Equipment, and Techniques in Selected Sunday Schools of the Evangelical Lutheran Church of America.* M. S. 1960, Stout State College, 219 p. L. (Menomonie, Wis.)

Purposes of study: To make readily available to Sunday school administrator or teacher, a source of information on the use of audiovisual materials and equipment and provide data on current audovisual practices within selected Sunday schools of the Evangelical Lutheran Church.

Source of data and method of study: A comprehensive review of all pertinent literature was conducted. This was followed by the construction of a checklist. This checklist was distributed on a stratified random sample basis to 150 Sunday schools in the Evangelical Lutheran Church.

Findings and conclusions: Practices relating to the use of such audovisual items as charts, flat pictures, slides, filmstrips, motion picture films, maps, chalk boards, bulletin boards, flannel boards, opaque projectors, and projection screens varied considerably. This variation was true not only between the items listed but also among small-, medium-, and large-sized Sunday schools.

Trained leadership for the audiovisual program was definitely lacking in most schools. Similarly, inservice training of teacher in the optimum use of such aids was short of a desired amount. Sunday schools made little study of audiovisual needs on which to base the program.

4306. LEIVISKA, RICHARD A. *Contributions to Industrial Education: An Annotated Index of Papers, Numbered 261 through 312, Submitted by Candidates for the Master's Degree Under Plans Othen Than A at the University of Minnesota.* M. A. 1961, University of Minnesota, 104 p. Department of Industrial Education (Minneapolis)

Purposes of study: To furnish an annotated index of the Plan B papers numbered 261 through 312 from June 1957 through June 1960, located at the Industrial Education Department of the University of Minnesota, and to furnish a summary of these writings for the future use of graduate and undergraduate students.

Source of data and method of study: A review of the plan B papers from June 1957 to June 1960 in industrial education at the University of Minnesota was made and a summary of each plan B paper was prepared.

Findings and conclusions: It was recommended that an annotated index of plan B papers be compiled in paperbound volumes. Each volume should contain annotations of 100 plan B papers, and would provide handy reference material for graduate and undergraduate students.

4307. LIVINGSTON, RALPH T. *A Comparison of Current Lettering Requirements with Arthur L. Ferry's Survey of 1950.* M. S. 1961, Kansas State Teachers College, 47 p. L. (Pittsburg)

Purpose of study: To determine the current practices regarding lettering in industry.

Source of data and method of study: Questionnaires were sent to 88 companies in several different types of industry selected from coast to coast.

Findings and conclusions: Vertical, uppercase lettering was used in most drafting rooms in industry. Job classification determined the importance of lettering, but most firms felt junior employees needed more stress on letter-

ing in school. One-eighth-inch lettering was most widely used, but drawing reductions forced draftsmen to use larger sizes in many instances. Inking, though on the decline, was considered too important to be discarded from the course of study.

4308. LONG, JOHN WILLIAM. *Inservice Education: with Implications for Industrial Arts Teachers.* M. A. 1961, The Ohio State University, L. (Columbus)

Purposes of study: To determine if industrial arts teachers recognize the need for help in their teaching duties; to present the values of inservice techniques; to determine what inservice techniques industrial arts teachers felt would be most valuable to them; and to present the most acceptable modern theory and practices, as evidenced by writings of authorities on inservice training, suitable for the industrial arts teachers.

Source of data and method of study: Data were developed from a survey of the ideas and opinions of professional authorities on inservice education and from a questionnaire formulated in keeping with the purposes of the study.

Findings and conclusions: Industrial arts teachers admitted a need for help in some areas of their teaching field. They were accepting the responsibility of acquiring professional growth by utilizing the inservice programs to some extent.

The inservice program should inform the teacher of the values of each activity in the program and should provide the type of training that can best fit the teachers to do their professional job.

4309. LOSEY, MARVIN LEE. *A Study of Physical Conditions and Major Equipment in the Industrial Arts Shops of Northeast Missouri.* M. A. 1961, Northeast Missouri State Teachers College, 189 p. L. (Kirksville)

Purpose of study: To ascertain the physical facilities and major equipment existing in industrial arts shops of the high schools in Northeast Missouri.

Source of data and method of study: Data were gathered by visiting all of the industrial arts shops (65) in the Northeast Missouri district north of U.S. Highway 24. Physical conditions and major equipment were tabulated and comparisons were made with AAA, AA, A, and Approved High Schools.

Findings and conclusions: Some of the shops were well located while others were still in damp, poorly lighted basements. Lighting was insufficient in most of the shops and shops were too small in a majority of the schools. Color schemes of most of the shops were poor. Most shops had only wall outlets for machine hookups. Fire extinguishers were available in most of the shops. Storage space and locker space was poor and auxiliary rooms were not available in many of the shops. In the metal area the equipment was most often a combination bench gas furnace, metal vise, drill press, anvil, and grinder. The electricity area was poorly equipped in most of the shops. The wood area had more major items of equipment than all other areas combined.

4310 LUSK, CHARLES GEORGE. *A Study of the Use of a Photographic File as a Teaching Aid in Industrial Arts.* M. A. 1960, University of Minnesota, 64 p. Department of Industrial Education (Minneapolis)

Purpose of study: To develop a means of conveying information to students who require continued individual attention after the teacher demonstration has been completed.

Source of data and method of study: The study was conducted by using two seventh-grade classes, a control and an experimental section. Carefully prepared photographic enlargements were used in the instructional procedure with the experimental group. Ease and amount of accomplishment were observed and differences noted. Other sources were displays of industrial exhibits, textbooks on displaying products, and visits to photographic shops.

Findings and conclusions: The use of photographic enlargements enabled students to complete assignments faster, created more interest, allowed teachers to provide more assistance for slower students, and increased student confidence in independent work.

4311. MANCHAK, PAUL J. *Direct-Camera-to-Receiver Television as an Instructional Aid in Industrial Education.* M. A. 1961, University of Maryland, 224 p. L. (College Park)

Purposes of study: To investigate and report the potentialities of the direct-camera-to-receiver television system for use as an instructional aid within a single classroom or laboratory. More specifically, the study was designed to examine the applicability, practicality, and acceptability of closed-circuit television when used as an instructional aid within industrial arts teaching areas at the college level.

Source of data and method of study: The study was designed to provide material whereby school administrators or other edu-

cational personnel could secure information regarding the direct-camera-to-receiver television facility. Such areas of information centered around (1) equipment requirements, (2) operational feasibility, (3) possible applications, (4) faculty attitudes, and (5) student opinions.

Findings and conclusions: Closed circuit television was found applicable and appropriate in teaching areas in which instruction was given in the Industrial Education Department at the University of Maryland during the 1959–60 academic year.

Evidence indicated that it is possible to use low-cost closed-circuit television as an instructional aid within a single classroom or laboratory where "one scene" views are involved.

Faculty and student responses to questionnaires and opinionnaires showed these groups to be highly in favor of the closed-circuit television as an instructional aid within industrial arts laboratory courses.

4312. MAXEY, TYRICE EDWARD. *Relation of Units Taken and Marks Earned in High School Industrial Arts Courses to Achievement in the Industrial Arts Curriculum at Northwestern State College.* M. S. 1961, Northwestern State College, 35 p. L. (Natchitoches, La.)

Purpose of study: To compare the relation of units taken and marks earned in high school industrial arts courses to achievement in the industrial arts curriculum at Northwestern State College.

Source of data and method of study: Data were secured from the college records of the graduates as found in the office of the Industrial Arts Department and the office of the Registrar of Northwestern State College.

Findings and conclusions: There is no relationship between the number of units taken in high school industrial arts courses and achievement in the industrial arts curriculum at Northwestern State College.

There is a positive but indeterminate relationship between the marks earned in high school industrial arts courses and achievement in the industrial arts curriculum at Northwestern State College.

4313. MUKAI, TERUO. *The Status of Industrial Arts in Hawaii.* M.A. 1961, State College of Iowa, 69 p. L. (Cedar Falls)

Purpose of study: To determine teacher qualifications in terms of preparation and experience, what type of shops were most common, types of courses offered, and educational methods used.

Source of data and method of study: Of the 115 questionnaires mailed, 71, or 61.7 percent, were returned. The 71 teachers represented 45, or 70.3 percent of the schools offering industrial arts in Hawaii.

Findings and conclusions: Industrial arts is offered in three-fourths of all the secondary schools in Hawaii, but in only four schools as low as the sixth grade. Approximately one-third of the teachers did not meet the Professional Teachers' Certificate requirements of 30 semester hours beyond the bachelor's degree, and one-fourth did not meet the secondary school subject field requirements of 36 hours in industrial arts, plus one course in the teaching of industrial arts. Only 5 of the 71 teachers have free periods during the school day. Woodworking, drawing, electricity and electronics, and metalworking were well represented in the industrial arts programs. Approximately one-third of the teachers taught in comprehensive general shops. Only three teachers reported that industrial arts was required in the schools in which they taught.

Recommendations are that industrial arts be included in all the schools; that certification requirements be more rigidly enforced; that every teacher have at least one free period each school day; that graphic arts and transportation and power be considered for industrial arts programs in future developments; that greater use be made of comprehensive general shop, especially in the smaller schools; and that girls be given more opportunity to take industrial arts.

4314. NELSON, GERHARD W. *Guidance Factors Contributing to an Appropriate Occupational Choice at the Saint Paul Technical-Vocational School.* M. S. 1961, Stout State College, 79 p. L. (Menomonie, Wis.)

Purpose of study: To evaluate the present guidance procedures at Saint Paul Technical-Vocational School.

Source of data and method of study: Analysis was made of the present records for students in the Saint Paul Technical-Vocational School. Norms were established by use of statistical methods. Procedures were developed to aid students in the selection of appropriate occupational choices.

Findings and conclusions: Prediction of scholastic success or failure based on entrance tests seems to merit some consideration. Students with a low Otis Intelligence Test score but a high Minnesota Paper Board score may have the ability to succeed in a trade-technical field, as this combination indicates a poor reader but not necessarily low intelli-

gence. Prediction of success in the electric, electronic, and engineering drafting field has a high correlation with the Minnesota Paper Board Form Test. Norms developed in this study have been extremely useful in guiding students into an appropriate field of endeavor. It is recommended that no cutoff score be used for any student, but that full consideration be given to each and every applicant. The coefficient of correlation is significant for both the Minnesota Paper Board Form Test and the Bennet Mechanical Test in relation to the engineering drafting instructor's grades; and, therefore, more emphasis should be placed on these scores in counseling students applying for this trade.

4315. NELSON, WALLACE ORVAL. *Bindery Work in the Graphic Arts with Course Outline and Instructor's Guide.* M. A. 1959, University of Minnesota, 58 p. Department of Industrial Education (Minneapolis)

Purposes of study: To survey the methods used and operations taught in the bindery field in Minneapolis Public Schools; to develop a course outline of use to instructors of bindery operations, and to develop a guide for instructors.

Source of data and method of study: A review of the literature revealed need for bindery instruction, but a paucity of information of value to teachers of bindery work. The main sources of data were two surveys of bindery operations taught in the Minneapolis Public Schools (1955 and 1959) and the experience of the writer as a tradesman and teacher in the graphic arts.

Findings and conclusions: The 1955 survey showed that although bindery operations were taught in Minneapolis schools, they were taught more by incidental methods than by planned units. A followup survey, conducted in 1959, revealed a more couscious effort to utilize the unit instructional plan and indicated an enrichment of the graphic arts program. Major modifications occurred where hard-cover binding and hand-sewing operations were added to the curriculums.

4316. PADHAM, ELWOOD ARNO. *A Followup Study of Graduates of the Industrial Arts Department at Gorham State Teachers College, Gorham, Maine, for the 10-Year Period 1948 through 1958.* M. A. 1961, University of Maryland, 134 p. L. (College Park)

Purposes of study: To investigate the effectiveness of the industrial arts teacher education program at Gorham State Teachers College and to identify needed curricular changes.

The study was concerned with the effectiveness of the program as reflected by the reactions and performance of the graduates for the period from 1948 to 1958.

Source of data and method of study: Information was obtained from graduates, superior teachers, principals, and a jury of educators by the use of questionnaires, and an evaluation form. Seventy-eight percent of the 160 graduates and all of the superior teachers returned the questionnaires. Seventy-eight percent of the 74 principals contacted returned the evaluation form, and 5 of the 6 members of the jury returned reactions to the study.

Findings and conclusions: General education courses thought to be most "essential to successful teaching" were English, Mathematics, and Public Speaking.

Professional courses offered by the Industrial Arts Department, judged to be "essential to successful teaching" were Shop Organization, Methods of Teaching Industrial Arts, Practical Mathematics, and Student Teaching and Conference.

Technical courses considered most "essential to successful teaching" were Woodwork I, Metalwork I, Mechanical Drawing, Transportation I, and Machine and Architectural Drawing. As indicated by the principals, graduates were better prepared in "Manipulative Ability" and "Shop Organization and Management" than in any other aspect of their education.

Instruction in Electricity "should be improved" while Economics II, Youth Activity, and History of Vocational and Industrial Arts Education were thought to be "of little value, should be dropped" by 30 percent of the graduates and 50 percent of the superior teachers.

4317. PARKS, BURTON OLIVER. *A Guide to the Teaching of Metals Processing I, II, and III; Industrial Education Department, University of Minnesota.* M.A. 1960, University of Minnesota, 170 p. Department of Industrial Education (Minneapolis)

Purpose of study: To develop the Metals Processing sequence of courses under the Minnesota Plan for Industrial Arts Teacher Education.

Source of data and method of study: Minnesota Plan for Industrial Arts Teacher Education, and other pertinent books, periodicals, and publications. Pertinent literature was reviewed and the Metal Processing sequence of courses was developed. The sequence of

courses was taught over a period of time to determine the effectiveness of the course content and teaching methods.

Findings and conclusions: A revision of the content and methods of the sequence of courses was made to better fulfill the needs of the students set forth in the Minnesota Plan. Extension of the methods devised in the Metals Processing courses to other areas of industrial arts teaching was recommended.

4319. REYNOLDS, DONALD FRANK. *A Study Guide for Apprentice Auto Mechanics.* M.A. 1960, Los Angeles State College of Applied Arts and Sciences, 226 p. L. (Los Angeles, Calif.)

Purposes of study: To revise the complete 4-year outline for apprentice auto mechanics and the second-year study guide and concentrate on the basic theory which will not become obsolete.

Source of data and method of study: Materials were gathered from industry through an advisory committee and other automotive industry representatives.

Findings and conclusions: This project involved the development of a study guide, and as such did not require a formal statement of findings and conclusions. The guide will be published by the California State Department of Education as a part of the Apprentice Instruction Materials Program.

4320. ROGERS, LAMAR ELWOOD. *The Status and Need for Industrial Arts in Louisiana High Schools.* M.S. 1961, Northwestern State College, 55 p. L. (Natchitoches, La.)

Purpose of study: To present data relative to the status and need for industrial arts in the curriculum of the high schools of Louisiana.

Source of data and method of study: Data were obtained from questionnaires mailed to the high school principals listed in the Louisiana School Directory No. 875; from Industrial Arts in Louisiana, Bulletin No. 730; and from other pertinent literature.

Findings and conclusions: One hundred forty-four white high schools offered industrial arts in 1959–60. Eighty-one teachers held a baccalaureate degree and 34 teachers had the master's degree. Courses taught by industrial arts teachers in addition to their major field included mathematics, general science, and physical education.

The general shop plan of organization was in use in 52 percent of the schools. The unit and/or combination general shop was in the remaining 48 percent. Most frequent course offerings were woodworking, mechanical drawing, and leathercraft. Too many small school units and the plan for financing the program are obstacles to be overcome before much expansion can be expected.

4321. SEDGWICK, LORRY KING. *The Effect on Spatial Perception of Instruction in Descriptive Geometry.* M.S. 1961, Southern Illinois University, 43 p. L. (Carbondale)

Purpose of study: To determine if instruction in descriptive geometry will improve spatial perception (visualization).

Source of data and method of study: Fifty-one matched pairs of engineering students, industrial education teaching majors, and industrial supervision majors enrolled at Southern Illinois University and Southeast Missouri State College were used to obtain data. The experimental group took descriptive geometry and the control group took no descriptive geometry or any other drawing course. Matching was based on preterm performance on the Space Relations Test of the Differential Aptitude Test, form A. Group to group post-term comparison was based on form B of the same test. The t test of mean difference and the F test of variance were applied to test hypotheses.

Findings and conclusions: Data indicated strongly that instruction in descriptive geometry does not affect or improve the ability of the student at spatial perception or visualization. Support was also given to the opinion that this is an innate ability not modifiable by specific experience.

Conclusions are that descriptive geometry is not justifiable in a curriculum as a means of improving visualization and, spatial perception is probably an innate capacity not modifiable by a specific instruction.

4322. SHARP, ROBERT LAMONT. *A Comparison of Related Information Available in Selected Publications Used in the Industrial Arts General Shop in Relation to the Missouri State Course of Study.* M.A. 1960, Northeast Missouri State Teachers College, 60 p. L. (Kirksville)

Purposes of study: To determine whether general shop text and reference books covered the related information as listed in the Missouri State Course of Study; to ascertain the amount of related information contained in the books; and to find out what other information was included in text and reference books which was not included in the course of study.

Source of data and method of study: General shop reference and textbooks and the Missouri State Course of Study for the General Shop were reviewed.

Findings and conclusions: There was a definite shortage of related information on some topics concerning the general shop. The topic which had the smallest coverage was the one dealing with American Industry. A considerable amount of related information was included in the wood and electricity areas. The areas of drawing and metalwork showed definite shortages of related information. There was a need for more related information about opportunities for occupational employment and other guidance material in all areas. There was a trend in the later editions and publications to include more related information and to add additional areas of work.

4323. SQUIRES, ELMER GENE. *The Development and Evaluation of a Suggested Device for Centering Round Stock.* M.A. 1961, Northeast Missouri State Teachers College, 72 p. L. (Kirksville)

Purposes of study: To study existing methods of centering round stock on a machine lathe and to design and fabricate an improved device; to test the new device for usability, durability, and accuracy; to determine whether it is patentable, and to survey its commercial possibilities.

Source of data and method of study: Existing methods of centering round stock were studied and their weaknesses identified. A new device was designed, constructed, and tested with the other methods in regard to accuracy and speed. A patent search was conducted after which a market survey was made.

Findings and conclusions: Present methods of centering round stock were found to be inadequate. A new design was developed and fabricated and proved to be patentable. Under experimentation the new device proved to be time-saving and in all cases with only one exception was found to be more accurate. An industrial market survey indicated that some companies would use the new device.

4324. SQUYRES, JAMES EARL. *A Survey of the Vocational Training Programs of the Correctional Institutions in Louisiana.* M.S. 1961, Northwestern State College, 64 p. L. (Natchitoches, La.)

Purpose of study: To review existing vocational training in correctional institutions of Louisiana.

Source of data and method of study: Data were obtained through personal interviews at the various institutions, from correspondence with the State Department of Institutions, and from a survey of the Louisiana Department of Institutions annual report.

Findings and conclusions: There are four correctional institutions in Louisiana offering vocational training. Students are allowed, under the supervision of a placement committee, to select a course of instruction. Any credits earned in these institutions may be transferred to a public high school. None of these institutions have a placement service to assist students in finding employment at the time of release.

4325. STEFFENSON, ARTHUR VALDEMAR. *An Investigation of Selected Science Applications in the Area of Metalwork.* M.A. 1960, University of Minnesota, 80 p. Department of Industrial Education (Minneapolis)

Purpose of study: To study science applications which were actually inherent in the metalwork program in the secondary schools.

Source of data and method of study: A survey was made of the science applications from industrial arts textbooks, industrial arts reference books, 10 State industrial arts curriculum bulletins, 5 courses of study of larger cities, science textbooks, science reference books, and periodicals.

Findings and conclusions: Metalwork in the junior and senior high school did offer a substantial contribution toward the attainment of scientific applications. The study of metals in the secondary school science courses was limited.

More attention should be devoted to a thorough study and evaluation of existing courses of study. A definite effort should be made to include metallurgy as a course in the curriculum of the industrial arts.

4326. STEWART, DONALD FREDERICK. *An Exploratory Experience in Industrial Arts Using Fired Glass with Wood.* M.Ed. 1961, The Ohio State University, 25 p. L. (Columbus)

Purposes of study: To develop a project to stimulate student interest. To introduce fiber glass laminated with wood, adhesives, methods, and the opportunity for students to exercise constructive thinking in relation to problem-solving.

Source of data and method of study: Developed in a school shop situation and documented from observations and data collected. Photographic study of the materials of the experiment was utilized.

Findings and conclusions: New ideas, if presented in an interesting manner, have educational value and will stimulate student interest. Learning experiences were of great value to the students in this study.

4327. STOCK, WILLIAM EARL. *Industrial Arts Objectives and Course Content for the Junior High School.* M.A. 1961, Iowa State Teachers College, 107 p. L. (Cedar Falls)

Purpose of study: To identify the stated objectives in industrial arts courses of study and the courses or units which should comprise the industrial arts curriculum, for the junior high school.

Source of data and method of study: Objectives were recorded from State and city industrial arts bulletins for the junior high school.

A list of courses or units offered in junior high school industrial arts was compiled and grouped into basic areas. A checklist was sent to a jury of progressive and successful industrial arts teachers in junior high school who were instructed to record their opinions as to which of the courses or units should be taught, and to indicate the grade level at which they should be taught.

Findings and conclusions: Industrial arts course or unit offerings in the seventh grade should be essentially drawing, woodworking, and some crafts; in the eighth grade should be essentially metals, drawing, woodworking, and some power-mechanics and crafts; in the ninth grade should include all the basic areas with limited emphasis on crafts. Courses or units involving the use of power machinery and the more hazardous operations and processes should be limited to the ninth grade.

4328. SWEARMAN, JACK FREDERICK. *An Analysis of Selected Commercial Literature Regarding Graphic Illustrations, Tools, Skills, and Terminology for Possible Use in Industrial Arts Consumer Education Course Content.* M.A. 1961, University of Maryland, 186 p. L. (College Park)*

Purpose of study: To analyze the basic content of commercial literature as a guide to curriculum planning of course content in industrial arts with reference to consumer education.

Source of data and method of study: Data were compiled from 234 pieces of selected commercial literature distributed or intended for distribution with household appliances between the years 1950 and 1959. The literature was contributed by 41 manufacturers and represented 62 different household appliances and devices.

Findings and conclusions: The literature contained 2,195 graphic illustrations which represented 6 percent of the total area of the literature. Of these illustrations, 46 percent represented pictures, 33 percent represented pictorial drawings, and 21 percent represented multiview drawings. Approximately 97 percent of the multiview drawings were of the one-view type; approximately 77 percent of the axonometric drawings were pictorial drawings of the isometric type; and of the 248 perspective projections 90 percent were angular perspective projections.

Thirty-four tools, 18 pieces of equipment or optional tools and 22 skills were found necessary for the householder to assemble, install, maintain, and repair the 62 selected household appliances that were included in the study. One hundred and two terms and abbrevations were determined as being pertinent to the 234 pieces of commercial literature examined in the study.

4329. TIPTON, WILLIAM ELI. *Principles, Services, and Adjustments of Automatic Headlight Controls.* M.A. 1961, Northeast Missouri State Teachers College, 68 p. L. (Kirksville)

Purpose of study: To ascertain the principles, services, and adjustments of automatic headlight controls installed on American-made automobiles.

Source of data and method of study: Periodicals, textbooks, and service manuals obtained from companies using automatic headlight controlling equipment on their automobiles.

Findings and conclusions: Little material was available that would lend itself to the teaching of the principles, services, and adjustments of automatic headlight controls on the vocational auto-mechanics level. The automatic headlight control was a device that promoted safer driving, and should be serviced by trained personnel. A unit of study pertaining to the principles, services, and adjustments could be taught to vocational auto-mechanics students of the twelfth grade. Proposals for units of instruction were made.

4330. WALLIS, DONALD ERLE. *A Followup Study of Former Senior High School Industrial Arts Students at Belle Plaine, Iowa,* M.A. 1960, Iowa State Teachers College, 64 p. L. (Cedar Falls)

Purpose of study: To determine the effectiveness of the industrial arts program of

the Belle Plaine High School in meeting the vocational and general needs of students and to evaluate the present program in the school.

Source of data and method of study: One hundred and nine formal male students who enrolled for industrial arts at least 1 year and graduated or dropped out of school during the years 1950 through 1958 were contacted. Personal data, work history, and military experiences were obtained by personal interviews.

Findings and conclusions: Eighty-seven percent of the students contacted graduated from high school and 42 percent had gone to college. Former students were consistent in recommending more advanced instruction and work assignments. They also recommended improvement of the physical plant in the areas of drafting, electricity, electronics, metal working, and auto mechanics. Former students felt a general knowledge of tools was a major contribution of the industrial arts program, and that safety instruction was helpful and important.

4331. WALTERS, DONALD W. *Types and Characteristics of Driver Education Programs in Class "B" High Schools in Michigan.* M.S. 1961, Stout State College, 64 p. L. (Menomonie, Wis.)

Purpose of study: To provide data for evaluating and revising the driver education program at Manistee High School, Manistee, Mich.

Source of data and method of study: An information blank was sent to all Class "B" high schools in Michigan to obtain teacher evaluations of the usefulness of various items in the driver education program and pertinent data concerning classroom instruction, the amount of time devoted to behind-the-wheel instruction, and the use of audiovisual materials in the course.

Findings and conclusions: This study revealed that the driver education program at Manistee High School compared favorably with similar programs offered at other Class "B" high schools in Michigan. Specific recommendations for the improvement of the driver education program were formulated.

4332. WEINMANN, JAMES ARTHUR. *Industrial Arts Programs in the Elementary Schools of Kansas.* M.S. 1960, Kansas State Teachers College of Emporia, 63 p. L. (Emporia)

Purposes of study: To obtain information concerning industrial arts facilities, equipment, and curricula in the elementary schools of Kansas; to determine the effectiveness of industrial arts programs; and to make recommendations for future industrial arts programs in the elementary curriculum.

Source of data and method of study: Data were obtained from questionnaires received from 350 teachers in elementary schools in Kansas.

Findings and conclusions: A wide variety of areas should be provided so individual students can work with tools and materials of their choosing. Industrial arts should be included in all grades of the elementary school for both boys and girls, and should be taught by the regular classroom teacher. Tools need to be of a size and quality which will make them easy to manipulate. There is a need for integration of industrial arts with other subjects. The teacher-preparatory program should include a class which will give specific instruction concerning tool and machine techniques; information relating to materials, supplies, and production of goods and services; and procedures for conducting industrial arts in the elementary school.

Staff Studies

4333. BRANDON, GEORGE L. *The Development of a Research Design To Investigate the Functional Understandings of Technicians as Bases for Curriculum Planning in Technical Education.* Staff Research, 1960, 81 p. Michigan State University and Cooperative Research Branch, United States Office of Education. Office of Research and Publications, College of Education, Michigan State University (East Lansing) (Also available to all libraries which subscribe to the Library of Congress Documents Expediting Project)

Purposes of study: To develop a research design to be used to investigate the work functions and understandings of industrial technicians. As primarily a study of exploration and development, the major purposes were to obtain descriptions of activities of highly skilled technicians; to determine if there existed a common core in the educational programs of technicians; to determine if clusters of technic occupations suggested a pattern of educational programs; to compile existing information on occupational adjustment relevant to technician roles; and to determine the extent to which technicians use scientific principles, both physical and social, in their occupations.

Source of data and method of study: Procedure consisted of the collection of data on occupational analyses and related publications, examination and analysis of data by experts in personnel analysis, occupational analysis, and research; and the development of a strategic research design for pilot and long-term projects as well as for the pilot project.

Findings and conclusions: Numerous occupational analyses were identified and surveyed: occupational classification systems; research reports and reviews of studies in personnel analysis; community, regional, and statewide surveys of technical manpower; research projects planned or in progress in the various governmental agencies and offices; and miscellaneous publications related to the nature of the research.

Additional exploration ultimately led to the construction of a matrix model as a design for technician research. The matrix is built around a vertical axis of elements (concepts, skills, and/or courses) and a horizontal axis of specific technical occupations. Essentially, the matrix could be constructed to be very broad in representing many technical occupations and a multitude of vertical elements of course content, course listings, concepts, and job activities. The matrix could, on the other hand, be quite narrow in limiting the number of technical occupations to a few in a given cluster or family, and a restricted number of elements on the vertical axis. Whatever the ultimate scope of the matrix, a group of "raters" would be employed to determine the value of the various elements in the vertical column.

Generally, the analysis of the matrix will be facilitated by the use of a single scale which indicates the entry's (*a*) relevance and (*b*) importance. If such a uni-dimensional scale is not devisable, then the relative contribution of an area of importance to a job will have to be provided through the weight given the ratings of that area or through the extent to which the area is differentiated in relation to other areas. These solutions would permit the development of ratings or scores for each matrix entry which could be analyzed in various ways.

Advantages of the matrix idea are: elements can be added to either axis; data can be analyzed in many ways; many pilot studies may be made; and possibly aptitudes, interests, personality factors, and human relations skills may be investigated. Disadvantages are: tasks and activities of technicians may change too rapidly to be evaluated; a great deal of time may be involved in rating a matrix of potentially several hundred columns or rows; and it may be necessary to make studies in areas in which no present information is available.

Two formal conferences of research personnel were held. Their composite recommendations make up the body of the final report of the research project, *Explorations in Research Design: Curricula for Technicians.* ER 1, Cooperative Research Project 629 (8186), November 1960.

4334. MOSS, JEROME, JR. *An Estimate of Quantitative Occupational Training Requirements for Indiana, 1960–70.* Staff Research, 1960, 48 p. Industrial Education Curriculum,

Purdue University (West Lafayette, Ind.)

Purpose of study: To determine the numbers of persons who would need some type of vocational education in Indiana between the years 1960 and 1970, with emphasis on trade and industrial occupations.

Source of data and method of study: Adjusted Bureau of the Census and Bureau of Labor Statistics figures were used to predict increases in employed persons, replacement needs, and the effects of occupational and geographical mobility in Indiana.

Findings and conclusions: The number of new entrants to the work force and the number of persons needing retraining or upgrading are reported separately for all major occupational groups, and for specific occupationally and educationally homogeneous "clusters" of trade and industrial occupations.

4335. PIERCE, HUGH. *Opinions of Michigan High School Faculties Concerning Cooperative Occupational Education.* Staff Research, 1960, 38 p. Coordinators Association, Southeastern Michigan. Instructional Materials Laboratory School of Education, University of Michigan (Ann Arbor)

Purposes of study: To interpret the values and needs of cooperative occupational education; and to improve understandings regarding its principles, objectives, and practices.

Source of data and method of study: A questionnaire was sent to 834 high school teachers in Michigan who had cooperative occupational students in their classes. There were 42 statements in the questionnaire, of which 41 were answered by checking "Strongly agree," "Agree," "Uncertain," "Disagree," or "Strongly disagree." Replies were received from 91 percent of the sample. A review of literature on work experience and cooperative education was made and statistical treatment of data within confidence limits was recorded.

Findings and conclusions: There should be careful selection of students for participation in cooperative occupational education.

Improved related instruction should be better integrated with work experience.

Better occupational counseling and information programs before placement should be emphasized.

More attention should be given to the development of understanding on the part of teachers, employers, and the community of the objectives, problems, and values of cooperative occupational education.

Subject Index

Studies are indexed by number under the subjects as indicated.

INSTRUCTION METHODS AND DEVELOPMENT

Doctor's

4246, 4256, 4259, 4260

Master's

4292, 4293, 4297, 4300, 4305, 4310, 4311

OCCUPATIONAL SURVEYS

Doctor's

4251, 4267, 4269

Master's

4271, 4276, 4285, 4289

Staff

4334

PHILOSOPHY AND OBJECTIVES

Doctor's

4239, 4248, 4254, 4266

Master's

4303, 4327

PLACEMENT AND FOLLOWUP

Doctor's

4240, 4261

Master's

4286, 4301, 4316, 4330

PROGRAM EVAULATION

Master's

4274, 4313, 4330

PROGRAM PLANNING

Master's

4282, 4286, 4290, 4296

PROGRAM STATUS

Master's

4270, 4273, 4274, 4313, 4320, 4324, 4332

SHOP PLANNING

Master's

4294, 4309

TEACHER EDUCATION

Doctor's

4242, 4250, 4254, 4258

Master's

4281, 4287, 4308, 4316, 4317

TESTING AND EVALUATION MATERIAL

Doctor's

4249, 4252, 4253, 4262, 4263

Master's

4280

TRAINING WITHIN INDUSTRY

Doctor's

4245, 4262

Master's

4275, 4277

VOCATIONAL GUIDANCE

Doctor's

4241, 4247, 4255, 4268

Master's

4304, 4314

MISCELLANEOUS

Doctor's

4237, 4265

Master's

4278, 4295, 4298, 4306

O