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ABSTRACT

Developed through a research grant by educators from Western Michigan University, this package was designed for community and junior college counselors and technical personnel. The material is to serve as an aid in providing a more efficient transfer program for industrial education students. Much of the information is a result of comments made by a representative group of counselors and deans at a work-study conference and is general in nature so that it can apply to any area of the country. Data are provided about the current and projected job market, job requirements, and educational needs for persons in industrial education in the three areas of industrial arts, technical education, and vocational education. The handbook is in question and answer format with figures and tables included for illustration of data. A list of degree-granting institutions, and an abbreviated version of the Occupational Outlook Handbook 1970-71 are appended. A sample booklet, representative of handbooks produced by several senior institutions is included, and contains information for the student relative to the transfer process. (GEB)

Handbook for
COUNSELORS

Conclusions and recommendations presented in this handbook are based upon the extensive research conducted as a part of the research study titled, "Development of Junior/Community College Curricula for Future Teachers of Industrial Education," USOE Sponsored Project No. 7-0074, Grant No. OEG-0-8-070074-3713 (085).

Much of the specific material is the result of comments made by a representative group of counselors and deans of technical studies of community/junior colleges at a work/study conference held on the campus of Western Michigan University in October, 1970. The content has also been reviewed by representative professional personnel in community/junior colleges and senior institutions in various states.

The research reported herein was performed pursuant to a grant with the Office of Education, U.S. Department of Health, Education, and Welfare. Contractors undertaking such projects under Government sponsorship are encouraged to express freely their professional judgment in the conduct of the project. Points of view or opinions stated do not, therefore, necessarily represent official Office of Education position or policy.

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CONSULTANTS/Bruce Kocher and Dennis Wilson

DESIGN AND PRINTING/James Ulmer, Michael Davis, and Douglas Cox

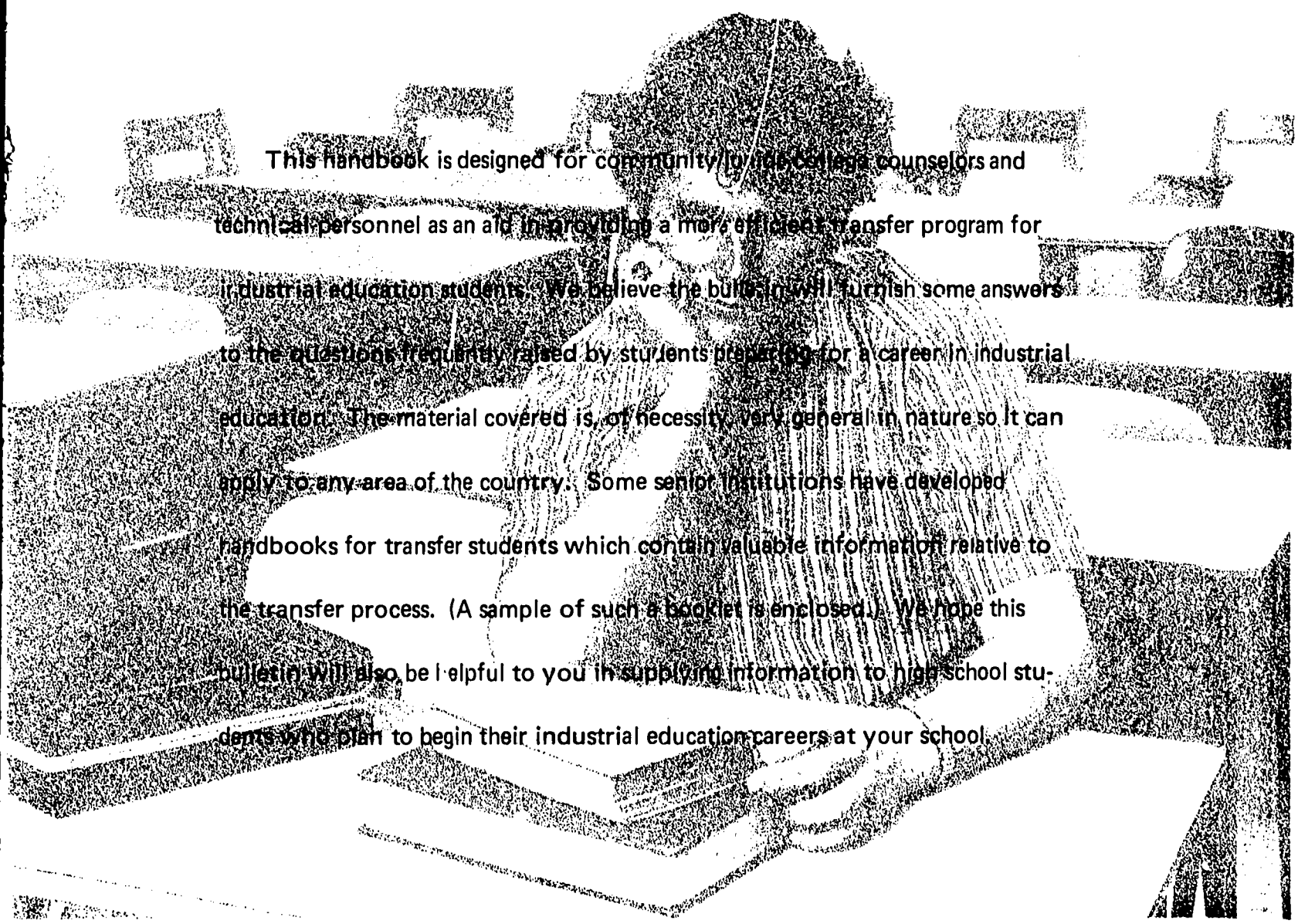
PHOTOGRAPHY/James Smith, John Carney, and Kalamazoo Valley Community College

PROJECT CO-DIRECTORS/John Feirer and John Lindbeck

PROJECT OFFICER/Elizabeth Simpson

SECRETARY/Judith Triemstra

PREFACE . . .



This handbook is designed for community/junior college counselors and technical personnel as an aid in developing a more efficient transfer program for industrial education students. We believe the bulletin will furnish some answers to the questions frequently raised by students preparing for a career in industrial education. The material covered is, of necessity, very general in nature so it can apply to any area of the country. Some senior institutions have developed handbooks for transfer students which contain valuable information relative to the transfer process. (A sample of such a booklet is enclosed.) We hope this bulletin will also be helpful to you in supplying information to high school students who plan to begin their industrial education careers at your school.

What is Included in The Term Industrial Education?

Industrial education is a generic term which broadly defines that part of the total education program which includes instruction in technical education, industrial arts, and vocational/industrial education.

Technical education is concerned with programs to prepare technicians. Technicians work on teams with engineers, scientists, supervisors, and skilled craftsmen converting theories and ideas into products and processes. There are two main types of technicians of concern in this bulletin; namely, the engineering technician and the industrial technician. "Engineering technology is that part of the engineering field which requires the application of scientific and engineering knowledge and methods combined with technical skills in support of engineering activities; it lies in the occupational area between the craftsman and the engineer, at the end of the area closest to the engineer." (American Society for Engineering Education) The industrial technician exhibits similar competencies within a narrower range of industry, such as drafting, instrumentation, automotive, printing, etc. Technical programs are normally offered in technical institutes and/or community/junior colleges.

Industrial arts is the study of industry and technology including its tools, materials, products, processes, and occupations. It is the body of related subject matter, or related courses, organized for the development of understanding about the technical, consumer, occupational, recreational, organizational, managerial, social, historical, and cultural aspects of industry and technology. Learning experiences involve activities such as experimenting, designing, constructing, evaluating, and using tools, machines, materials, and processes which provide opportunities for creativity and problem solving. The unique goals of industrial arts are:

To develop an insight and understanding of industry and its place in our culture.

To discover and develop talents, aptitudes, interests, and potentials of individuals for technical pursuits and applied science.

To develop an understanding of industrial processes and practical application of scientific principles.

To develop basic skills in the proper use of common industrial tools, machines, and processes.

To develop problem-solving and creative abilities involving the materials, processes, and products of industry.

Programs may be at levels from K-12, although most specialized classes are offered at the junior and senior high school levels.

Vocational/industrial education, or trade and industrial, is a branch of vocational education which is concerned with preparing people for initial employment or for upgrading or retraining workers in a wide range of trades and industrial occupations. Such occupations involve planning, designing, producing, building, processing, assembling, testing, maintaining, servicing, or repairing any product or commodity. Instruction is provided in basic manipulative skills, safety, and related occupational information in mathematics, drafting, and science required to perform successfully. Programs may be at the secondary or post-secondary levels.

What is the Relationship of Industrial Education to Occupational Education?

Industrial education is a part of a broader program of occupational education. Occupational education deals with preparation for all of the careers in our economy. It refers to learning experiences related to jobs which make up major employment areas. According to the United States Department of Labor, there are 21,741 separate and distinct occupations. These are described in the Dictionary of Occupational Titles. American education should provide some preparation for all students entering these occupations. The major role of the schools is, however, to provide occupational preparation for the 700 most common occupations that are described in the Occupational Outlook Handbook. Occupational teachers work in programs of business, distributive, health, agriculture, industrial education, home economics, transportation, and other emerging areas. All teachers and supporting educational personnel should contribute to the total occupational education. The Appendix contains a brief summary of the Occupational Outlook Handbook that should serve as a guide for all who are interested in occupational information and counseling.

What is the Number One Problem In Industrial Education?

The answer to this is a manpower shortage. Specifically, there is a need for a substantial increase in the supply of well-trained teachers and supporting personnel in industrial education. This problem is critical and, if the answer isn't found soon, there will be an insufficient supply of teachers for many of the students who will need training to enter the world of work. This shortage of teachers, if allowed to continue, will be reflected in the numbers of skilled workers and technicians available for American industry. America's industrial growth will suffer for the lack of adequately trained workers.

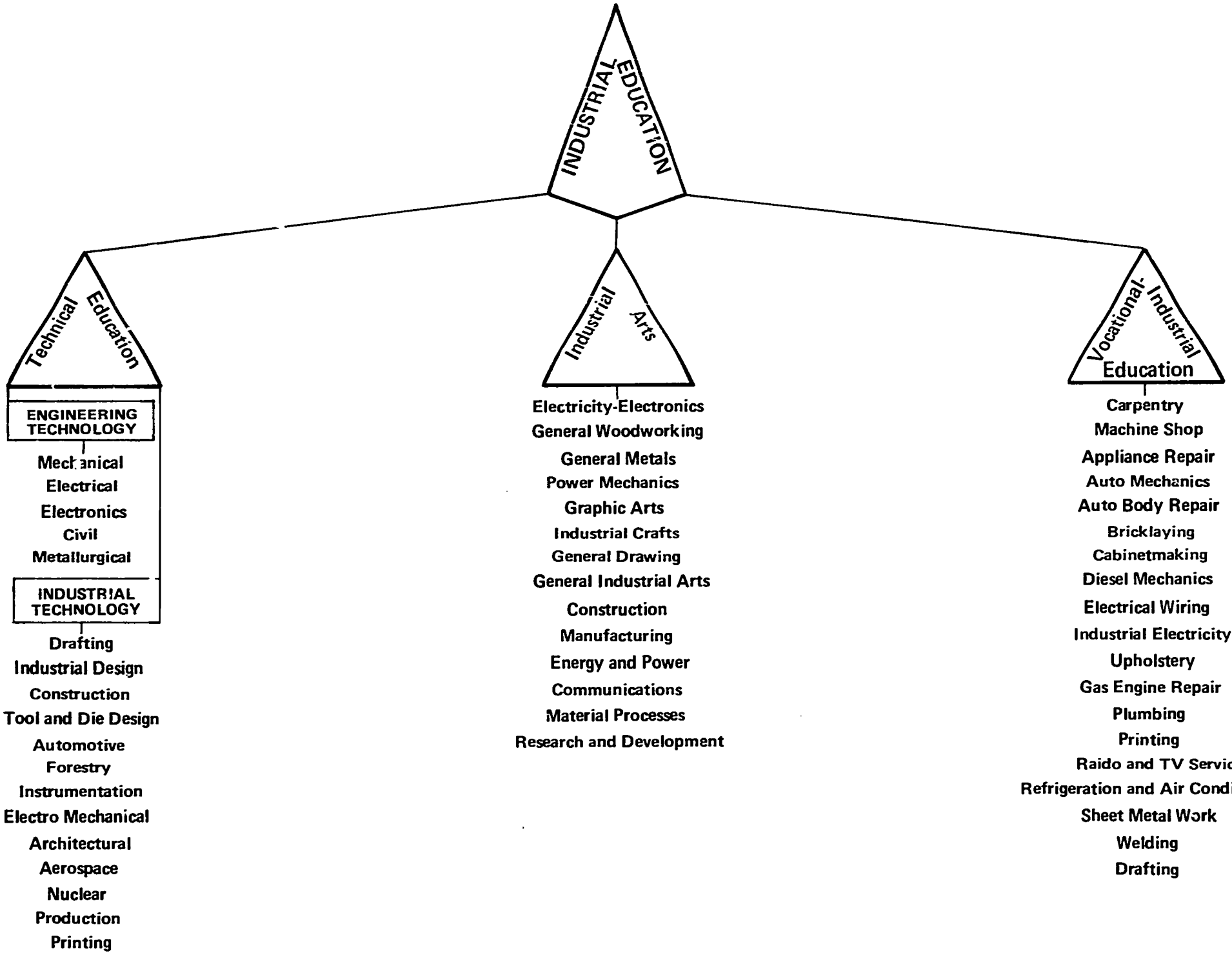

INDUSTRIAL EDUCATION
Technical Education
ENGINEERING TECHNOLOGY
Mechanical
Electrical
Electronics
Civil
Metallurgical
INDUSTRIAL TECHNOLOGY
Drafting
Industrial Design
Construction
Tool and Die Design
Automotive
Forestry
Instrumentation
Electro Mechanical
Architectural
Aerospace
Nuclear
Production
Printing
Industrial Arts
Electricity-Electronics
General Woodworking
General Metals
Power Mechanics
Graphic Arts
Industrial Crafts
General Drawing
General Industrial Arts
Construction
Manufacturing
Energy and Power
Communications
Material Processes
Research and Development
Vocational-Industrial Education
Carpentry
Machine Shop
Appliance Repair
Auto Mechanics
Auto Body Repair
Bricklaying
Cabinetmaking
Diesel Mechanics
Electrical Wiring
Industrial Electricity
Upholstery
Gas Engine Repair
Plumbing
Printing
Raido and TV Service
Refrigeration and Air Conditioning
Sheet Metal Work
Welding
Drafting

FIGURE ONE

What is the Current and Projected Status of Supply For Beginning Industrial Education Teachers?

As you can see in Figure Two, there are about 119,500 industrial education teachers including approximately 53,500 industrial arts, 52,500 vocational/industrial, and 13,500 technical education teachers. These are full-time teachers and this does not include the thousands who teach part time in various industrial education programs. At least 20,000 new full-time industrial education teachers will be needed annually for additions and replacements according to current demand estimates.

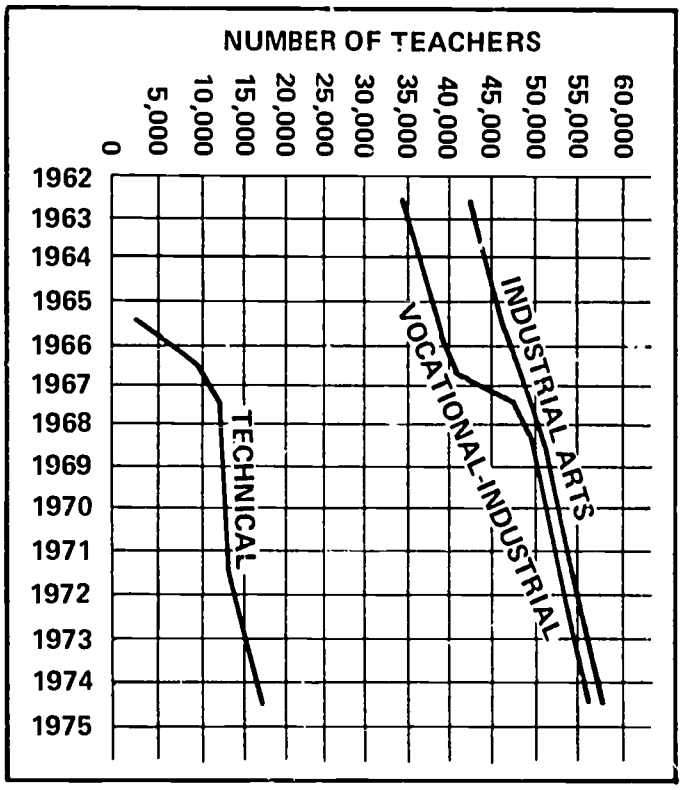


FIGURE TWO

Total Number of Industrial Arts, Vocational/Industrial, and Technical Education Teachers (USOE)

What Are the Teaching Opportunities In Industrial Education?

The major opportunities are as follows:

INDUSTRIAL ARTS IN THE JUNIOR HIGH OR MIDDLE SCHOOL -- A typical teaching assignment includes courses in general industrial arts (some work in metal, wood, drawing, electricity, power, and graphic arts) or courses such as construction, manufacturing, energy and power, communications, and general industry.

INDUSTRIAL ARTS IN THE SENIOR HIGH SCHOOL -- Typical teaching assignment includes specific courses in drafting, woodworking, building construction, metalworking, automechanics, electricity/electronics, graphic arts, plastics, and many others.

VOCATIONAL/INDUSTRIAL (T&I) AT THE UPPER SENIOR HIGH SCHOOL, AREA VOCATIONAL SCHOOL, OR VOCATIONAL DIVISION OF THE COMMUNITY/JUNIOR COLLEGE -- Typical teaching assignment: teach courses in welding, machine shop, carpentry, etc., or related subjects in mathematics and science.

TECHNICAL EDUCATION IN TECHNICAL INSTITUTES AND COMMUNITY/JUNIOR COLLEGES -- Courses taught in the area of specialty, such as metallurgy, electronics, drafting, fluid power, quality control, and others.

What are the Major Technical Areas in Industrial Arts?

The major technical areas in industrial arts include the following:

DRAFTING including machines, mechanical drawing, machine drawing, engineering graphics, architecture, and drafting related to all technical areas.

ELECTRICITY/ELECTRONICS including electronics technology, electrical wiring, motor repair, radio-tv servicing, industrial electricity, appliance servicing, and instrument repair.

PLASTICS including molding methods, vacuum forming, compression molding, injection molding, laminating, fabricating, and finishing.

GRAPHIC ARTS including hand composition, machine composition, letterpress and bindery, lithography, photography, and other related areas.

METALS including machine shop, sheet metal, welding, foundry, forging, and art metal.

POWER/AUTO includes the sources of energy, power producing machines, methods of power transmission on land, sea, and air, internal combustion engines and applied fluid power.

WOOD including woodworking, millwork, upholstery, building construction, and finishing.

In Which Technical Areas Are the Shortages Greatest?

The technical areas of electricity/electronics, graphic arts, plastics, and power/auto are the areas which have the greatest teacher shortages. However, there is a need for good industrial education teachers in all technical areas and at all levels, particularly in the intercity secondary and post-secondary schools. Such large urban centers as Chicago, Detroit, Los Angeles, and New York regularly have openings for well-qualified industrial education teachers. An industrial education graduate willing to move to where the jobs are will have no difficulty in securing employment. All of the ten largest states consistently have shortages of industrial education teachers. There are only a few of the smaller states in which there is sometimes a surplus of industrial education graduates.

How Does One Become an Industrial Education Teacher?

Specifically, the preparation of teachers has developed as follows: (See Figure Four.)

INDUSTRIAL ARTS -- In years past, most industrial arts teachers followed the four-year college route. Students enrolled directly in one of the 230 senior institutions in the United States which offered a degree in industrial arts. Normally, the students who completed the baccalaureate degree secured a beginning teaching position with no further education or work experience. Today, however, most industrial arts teachers begin their preparation in the community/junior colleges. In a recent study, it was found that 70 percent of the industrial arts teachers in preparation in the six states of California, Florida, Illinois, Michigan, New York, and Texas were transfer students from community/junior colleges.

VOCATIONAL/INDUSTRIAL -- Formerly, most of the vocational/industrial teachers were master craftsmen who were selected to teach in vocational programs. These craftsmen were required to take a certain number of professional education courses to qualify as teachers. Presently, about 30 schools in the United States have four-year degree programs in vocational/industrial education. In these programs, students must either have the occupational experience before they attend college or must secure it in a cooperative program as part of their college program. Most states require two or more years of occupational experience to become certified to teach in vocational/industrial programs. The exact amount of occupational experience varies from state to state and is clearly spelled out in each state master plan for vocational education.

TECHNICAL -- Technical teachers in community/junior colleges and technical institutes come from a variety of sources as can be seen in Figure Three.

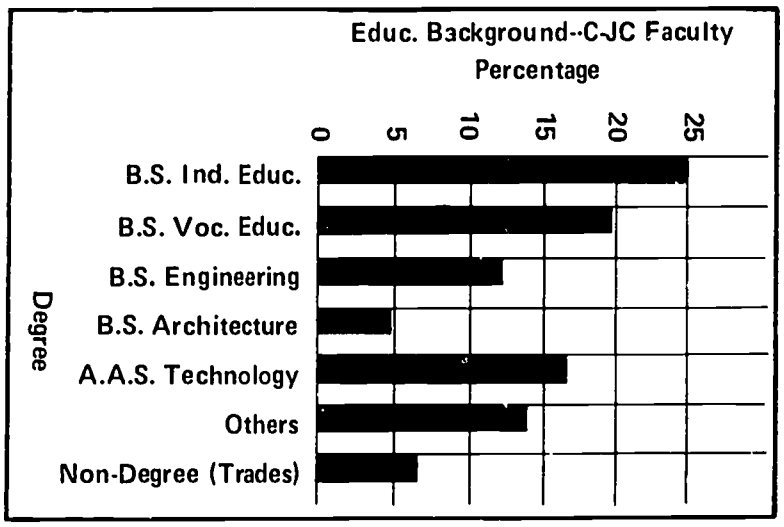
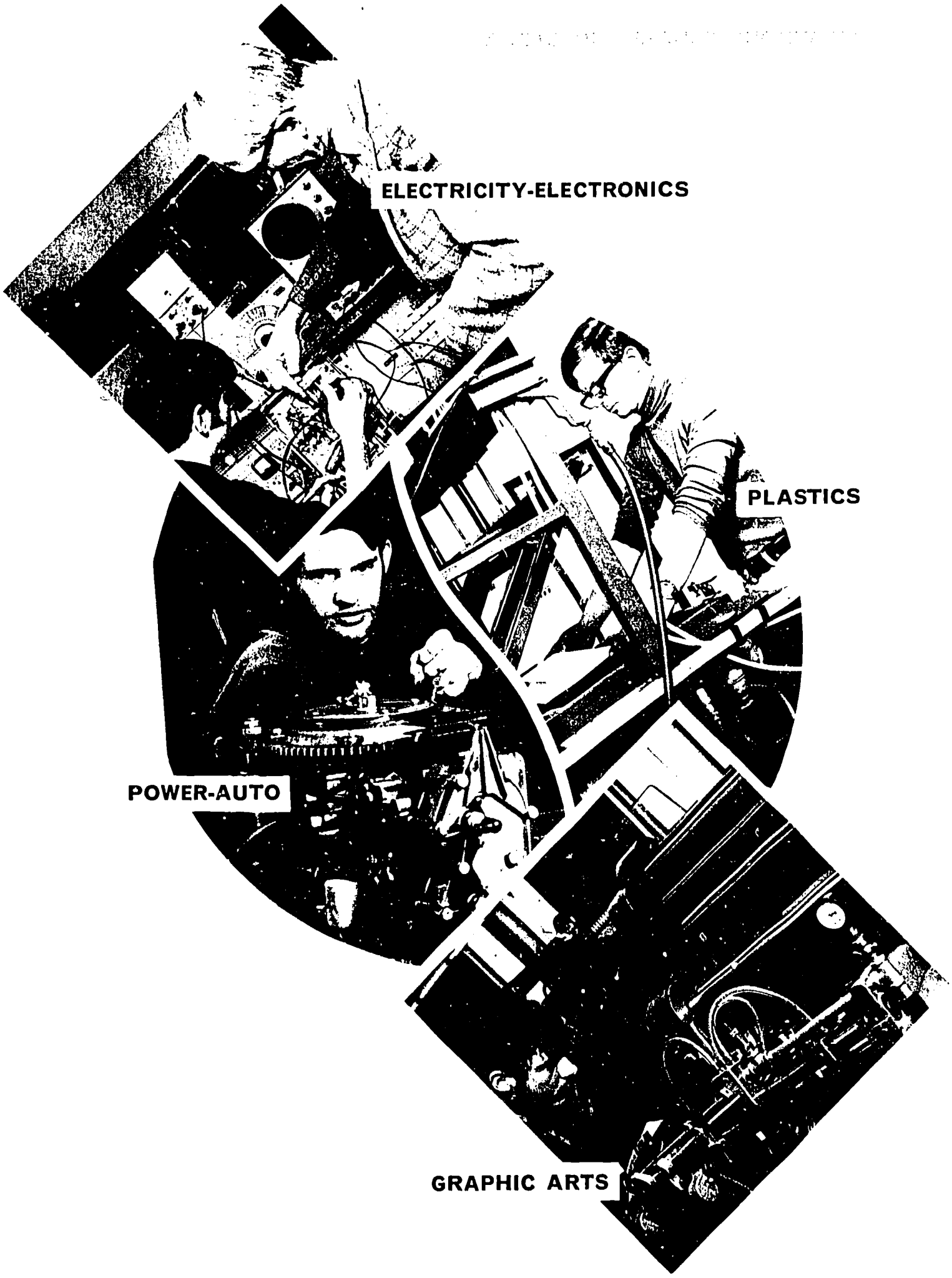


FIGURE THREE

Approximately, 45 percent of the faculty hold B.S. degrees in industrial or vocational education. These teachers also have a number of years of teaching experience and many have special qualifications as shown in Figure Five. Most technical teachers have a number of years of experience in business or industry.


ELECTRICITY-ELECTRONICS
PLASTICS
POWER-AUTO
GRAPHIC ARTS

Sources of Industrial Education Teachers

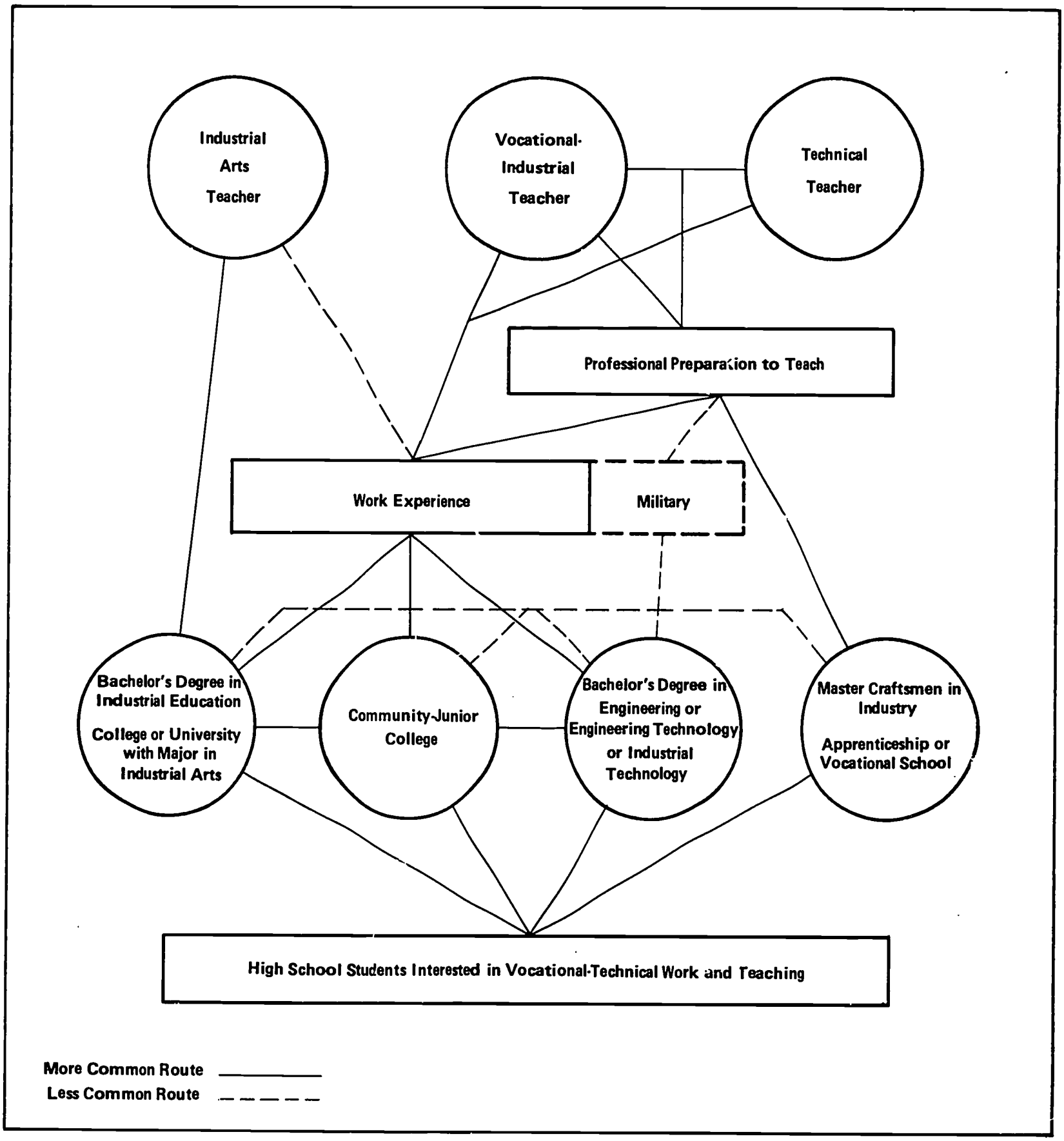
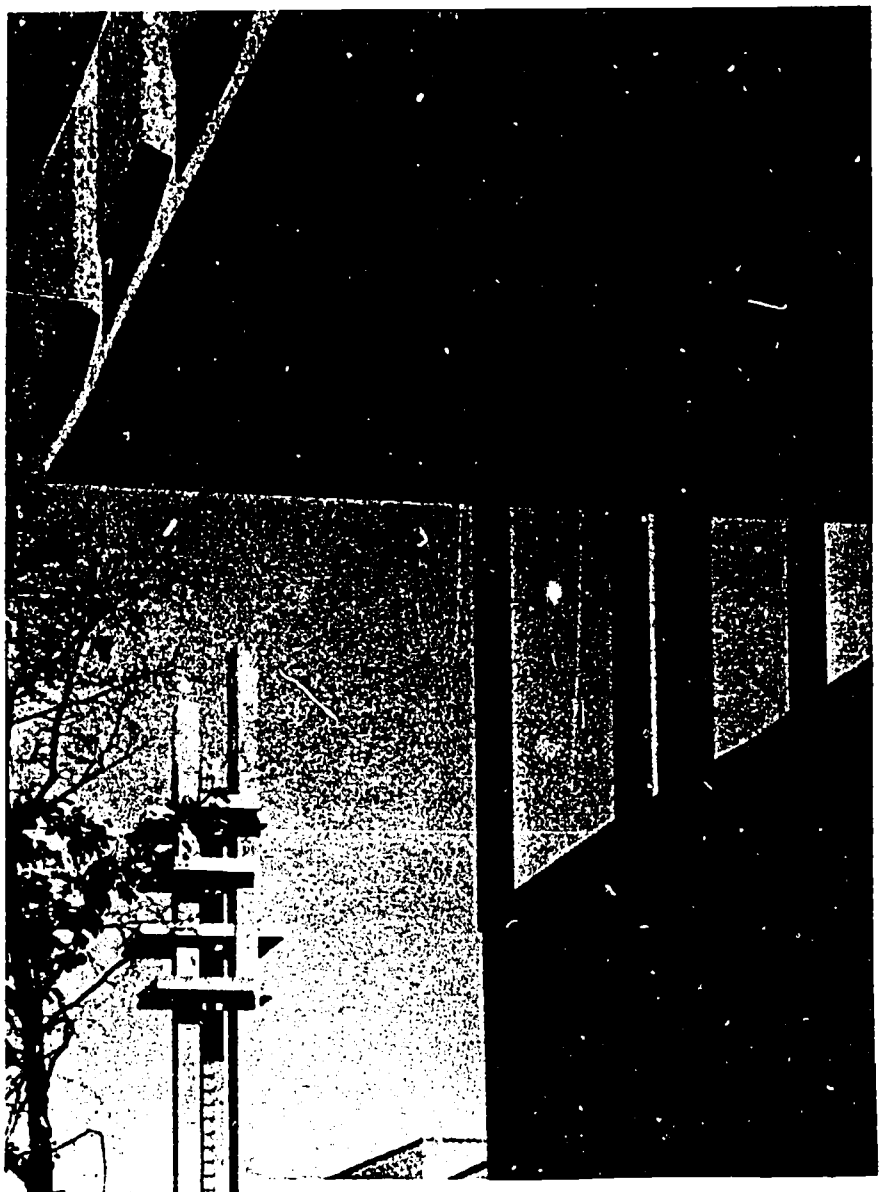


FIGURE FOUR



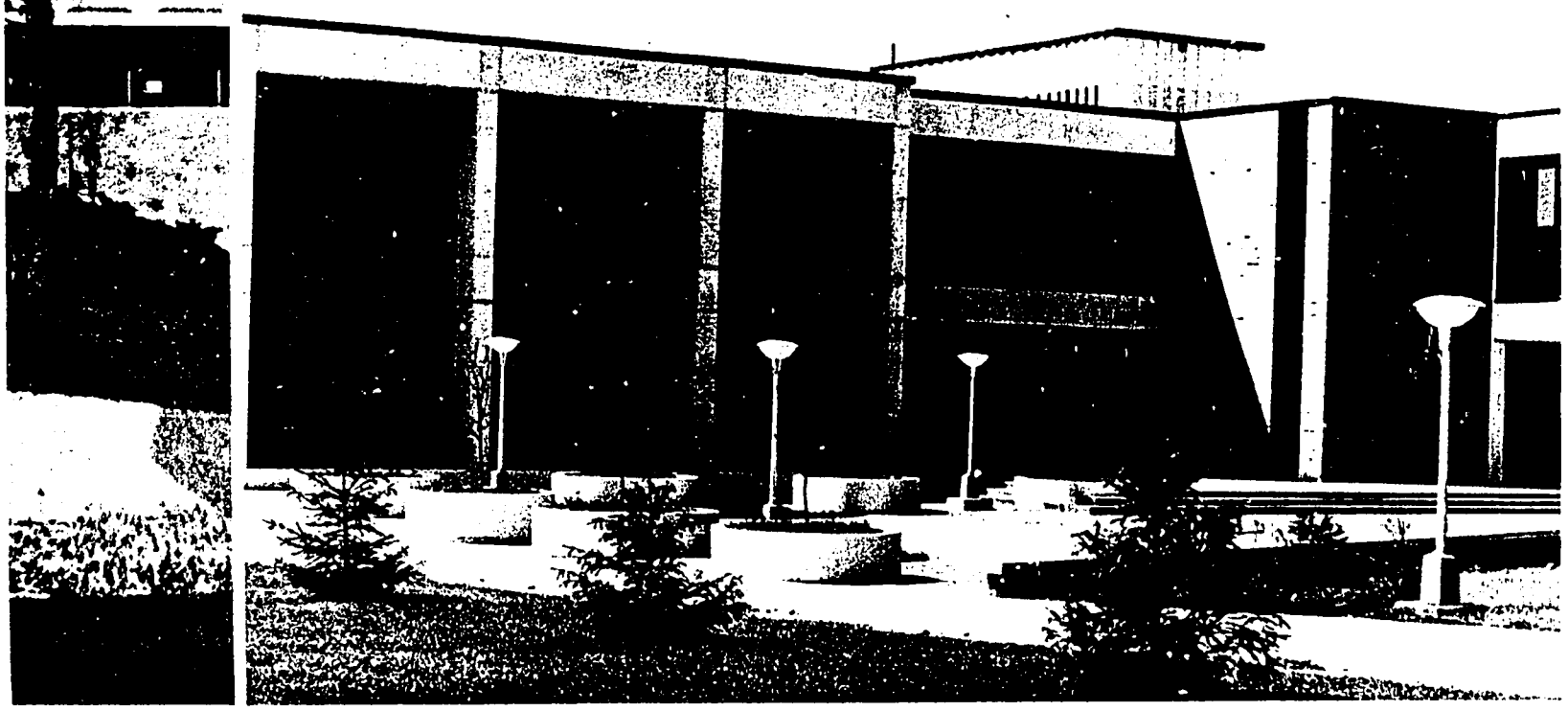
COOPERATION

BETWEEN

COMMUNITY/JUNIOR COLLEGES

AND

SENIOR INSTITUTIONS



Special Qualifications of C-JC Tech. and/or Voc. Staff

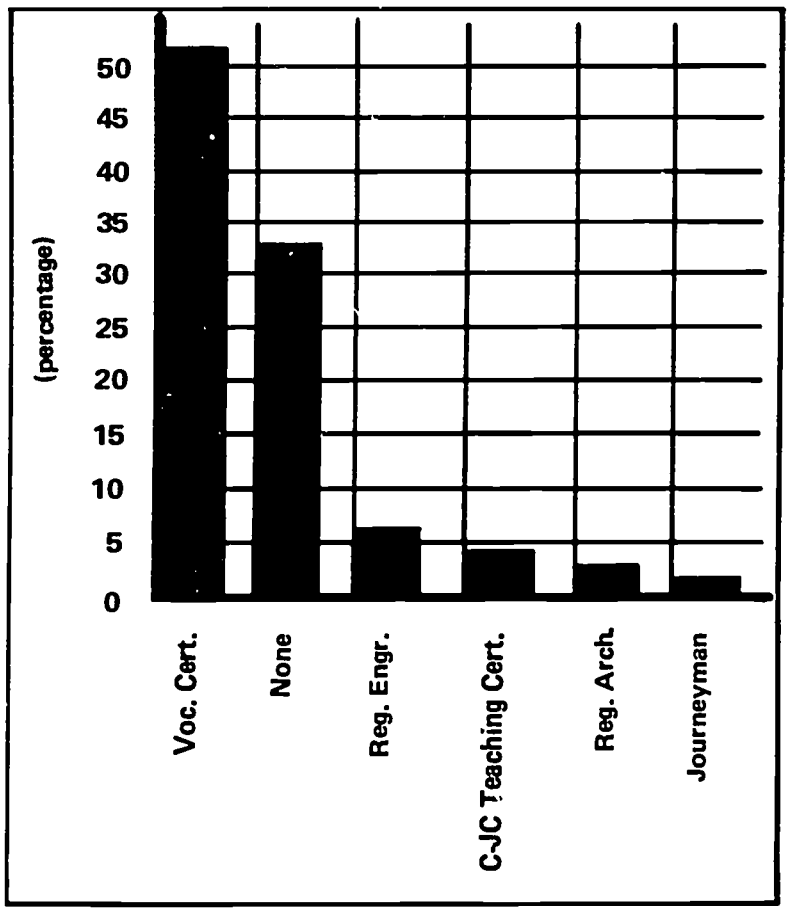


FIGURE FIVE

How Can the Community/Junior College And the Senior Institution Cooperate in Preparing Industrial Education Teachers?

There are two basic approaches that can be utilized. These are defined as the Pyramid and the Partnership programs.

PYRAMID PROGRAM

The PYRAMID program, which is currently being utilized throughout the country, builds a B.S. or B.A. degree at the senior institution on the two year A.A.S. degree in one of the engineering or industrial technologies offered at the community/junior college. This program is best suited to preparing teachers for advanced senior high school industrial arts, vocational/industrial, and technical education. The senior institution would accept the first two years of the A.A.S. in technology as the first two years of teacher preparation in industrial education. The senior institution then has the responsibility of building onto these first two years to develop a competent teacher in a specific vocational/industrial or technical area. The senior institution can handle the last two years on an individual student basis or may provide a catalog listing of the specific requirements necessary to complete the degree beyond the first two years of the A.A.S. program. The time needed to complete a degree under the PYRAMID program will vary from school to school and with the kind of program into which the student transfers. It will depend largely on how many of the technical credits will transfer. Many senior institutions have a program that requires only two more years to complete a B.S. degree. The technical specialty, however, must be the same as the one the student completed at the community/junior college. For example, if the student is an electricity/electronics major, then his teaching specialty must be in that area. He cannot complete a general industrial arts degree in two years in most institutions. It is for this reason that a second program has been recommended.

PARTNERSHIP PROGRAM

The PARTNERSHIP program, or the two and two approach, is a pre-industrial program for community/junior colleges. This program would outline a specific curriculum at the community/junior college designed especially for students who are planning to complete a teaching degree in industrial education. In this type of program, cooperation between interested personnel in the community/junior college and the senior institution must agree on such matters as:

ACADEMIC REQUIREMENTS in each of the two institutions and how these may be transferred.

TECHNICAL OFFERINGS in the community/junior college which are suitable for teacher preparation in industrial education. The student should take courses in as many technical areas as are available. Beginning courses in drafting, electricity/electronics, metalworking, and others should be selected.

NEW COURSES needed in a technical or professional area.

The two-year, pre-industrial teacher curriculum should be worked out so that an articulation agreement can be reached between the two institutions. The program should be included in the community/junior college catalog as another career opportunity. Community/junior colleges, in turn, should advise high school seniors of the opportunities for beginning their preparation as industrial education teachers at the community/junior college level.

The curriculum listed in the community/junior college catalogs should outline specific courses to be taken the first two years of this program. Whenever possible, at least one professional education course should be offered during the first two years to orient students to industrial education teaching.

Under this approach, a student could come to the senior

institution and complete a general industrial arts degree in two years. However, he must have taken the pre-industrial curriculum.

Is College Transfer Credit Usually Given for Work Experience?

Many institutions provide college credit for work experience for those students who plan to become vocational/industrial teachers, providing the work experience is in the same area as the technical specialty they plan to teach. The amount of college credit varies, ranging from 12 to 24 semester hours, and is usually specified in the college catalog.

What Are the Other Occupational Opportunities For a student Who Specializes In the Field of Industrial Education?

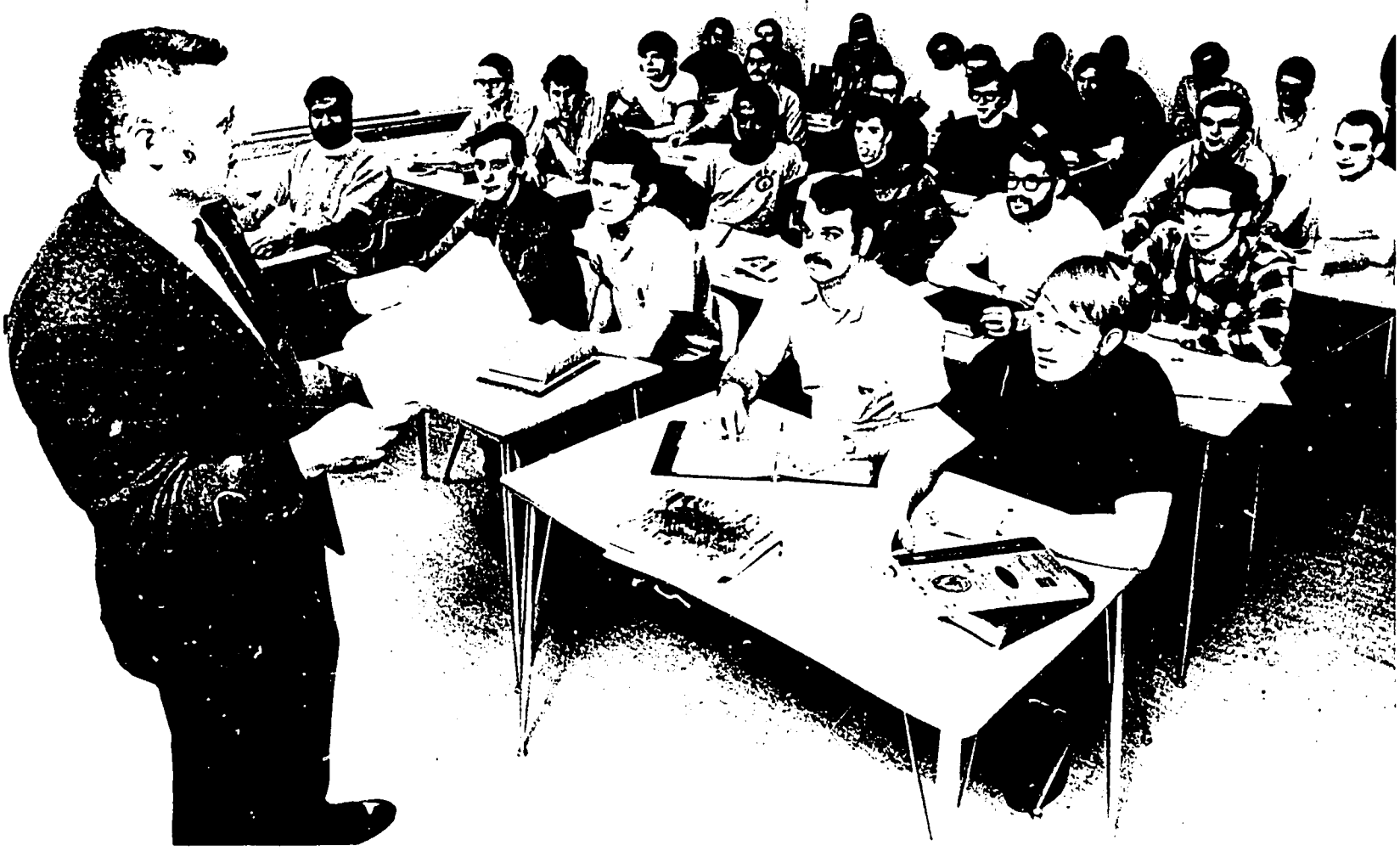
There are many opportunities for the student who graduates with a major in industrial education to enter industry. Approximately 30 percent of all industrial education majors do choose this route rather than teaching. There are positions available in educational programs in industry such as training directors, supervisors, field personnel, and related jobs. Industry is also looking for personnel with a general industrial arts background for positions in mid-management, supervision, and in many areas of product development.

What Value is the Community/ Junior College Transfer Student Handbook to the Counselor?

Some senior institutions are developing a transfer handbook for students who plan to transfer from the technical programs of the community/junior college to the industrial education program. This type of bulletin outlines in detail course requirements, curriculum, fees, transfer problems, counseling information, etc. Heads of industrial education departments in senior institutions are generally willing to work with community/junior colleges in developing specific materials for that institution. Every opportunity should be utilized to develop a working relationship between the community/junior college and the senior institution in your geographic area.

Where can a Student Enroll For Programs in Industrial Education?

The Appendix contains a list of the major colleges and universities that offer degrees in industrial arts, vocational/industrial, and technical education. Any student interested in transferring to one of these institutions should write to the head of the industrial education department at the earliest opportunity to determine how his work and course credits can be transferred.



Counselors should acquaint high school students with industrial education so that they can begin their preparation to become industrial education teachers in the community/junior college. If they plan to become general industrial education teachers, it is highly desirable that they follow a pre-industrial curriculum so that they can get a broad balance of courses in general studies and a variety of technical areas. The students who plan to become vocational/industrial teachers should be aware of the fact that they must secure two or more years of industrial experience and complete the four years of the college program. In some cases, senior institutions do provide for students to secure part of the industrial experience during the regular school year. However, if they are transfer students from community/junior colleges, there will be little time to secure this industrial experience unless it is done before entering the senior institution.

It is recommended that the community/junior college provide a simple folder describing the pre-industrial teacher curriculum that can be started at the particular community/junior college. It is also recommended that a slide presentation be prepared showing the opportunities in a variety of technical programs available at the community/junior college.

PPENDIX . . .

lleges and Universities Offering Degrees in Industrial Arts, ocational/Industrial and Technical Education

LABAMA
abama Agricultural and Mechanical University
uburn University
uskegee Institute
niversity of Alabama

RIZONA
izona State University
orthern Arizona University

RKANSAS
ricultural, Mechanical, and Normal College
kansas A&M College
ate College of Arkansas
niversity of Arkansas

ALIFORNIA
alifornia State College at Long Beach
alifornia State Polytechnic College
hico State College
resno State College
umboldt State College
alifornia State College at Los Angeles
acific Union College
an Diego State College
an Francisco State College
an Jose State College
niversity of California (master's degree only)

OLORADO
dams State College
niversity of Northern Colorado
olorado State University
outhern Colorado State College
estern State College of Colorado

ONNECTICUT
entral Connecticut State College
niversity of Connecticut

LORIDA
lorida A&M University
lorida State University
niversity of Florida
niversity of Miami
niversity of South Florida
niversity of Tampa
niversity of West Florida

GEORGIA
Berry College
Georgia Southern College
Savannah State College
University of Georgia

HAWAII
Church College of Hawaii
University of Hawaii

IDAHO
University of Idaho

ILLINOIS
Bradley University
Eastern Illinois University
Illinois State University
Chicago State College
Northern Illinois University
Southern Illinois University
University of Illinois
Western Illinois University

INDIANA
Ball State University
Indiana State University
Purdue University

IOWA
Iowa State University
University of Northern Iowa
Westmar College
William Penn College

KANSAS
Bethel College
Fort Hays Kansas State College
Friends University
Kansas State College of Pittsburg
Kansas State Teachers College
McPherson College
Wichita State University

KENTUCKY
Berea College
Eastern Kentucky University
Kentucky State College
Morehead State University

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Murray State University
University of Kentucky
Western Kentucky University

LOUISIANA
Grambling College
Louisiana State University
Northwestern State University
Southeastern Louisiana University
Southern University and A&M College
University of Southwestern Louisiana

MAINE
University of Maine at Portland-Gorham

MARYLAND
University of Maryland--Eastern Shore
University of Maryland (College Park)

MASSACHUSETTS
Fitchburg State College

MICHIGAN
Andrews University
Central Michigan University
Eastern Michigan University
Ferris State College
Michigan State University
Northern Michigan University
The University of Michigan
Wayne State University
Western Michigan University

MINNESOTA
Bemidji State College
Mankato State College
Moorhead State College
St. Cloud State College
University of Minnesota (Minneapolis)
University of Minnesota (Duluth)
Winona State College

MISSISSIPPI
Alcorn Agricultural and Mechanical College
Jackson State College
Mississippi State University
Mississippi Valley State College
University of Southern Mississippi

MISSOURI
Central Missouri State College
Northeast Missouri State College
Northwest Missouri State College
Southeast Missouri State College
Southwest Missouri State College
University of Missouri

MONTANA
Montana State University
Northern Montana College
Western Montana College

NEBRASKA
Chadron State College
Kearney State College
Peru State College
University of Nebraska (Lincoln)
University of Nebraska at Omaha
Wayne State College

NEVADA
University of Nevada

NEW HAMPSHIRE
Keene State College

NEW JERSEY
Glassboro State College
Montclair State College
Newark State College
Rutgers University The State University of New Jersey
Trenton State College

NEW MEXICO
Eastern New Mexico University
New Mexico Highlands University
University of New Mexico

NEW YORK
The City College of the City University of New York
City University of New York
Columbia University (master's degree only)
New York University
State University College at Buffalo
State University College at Oswego

NORTH CAROLINA
North Carolina Agricultural & Technical State University
Appalachian State University
East Carolina University
Elizabeth City State University
North Carolina State University at Raleigh
Western Carolina University

NORTH DAKOTA
North Dakota State School of Science
University of North Dakota (Grand Forks)

OHIO
Bowling Green State University
Central State University
Kent State University

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Miami University
Ohio Northern University
The Ohio State University
Ohio University
The University of Akron
University of Cincinnati
University of Toledo
Wilmington College

OKLAHOMA
Central State College
East Central State College
Langston University
Northeastern State College
Northwestern State College
Oklahoma State University
Panhandle State College
Southeastern State College
Southwestern State College

OREGON
Oregon State University

PENNSYLVANIA
California State College
Cheyney State College
Millersville State College
The Pennsylvania State University
Temple University
University of Pittsburgh

RHODE ISLAND
Rhode Island College

SOUTH CAROLINA
Clemson University
South Carolina State College

SOUTH DAKOTA
Black Hills State College
Dakota State College
Northern State College
South Dakota State University
Southern State College

TENNESSEE
Austin Peay State University
East Tennessee State University
Memphis State University
Middle Tennessee State University
Southern Missionary College
Tennessee State University
Tennessee Technological University
The University of Tennessee

TEXAS
Abilene Christian College
East Texas State University
North Texas State University
Prairie View Agricultural and Mechanical College
Sam Houston State University
Southwest Texas State University
Southwestern Union College
Sul Ross State University
Tarleton State College
Texas A&M University
Texas A&I University
Texas Southern University
University of Houston
West Texas State University

UTAH
Brigham Young University
Southern Utah State College
Utah State University

VERMONT
University of Vermont

VIRGINIA
Hampton Institute
Old Dominion University
Virginia Polytechnic Institute & State University
Virginia State College
Norfolk State College

WASHINGTON
Central Washington State College
Eastern Washington State College
University of Washington
Walla Walla College
Washington State University
Western Washington State College

WEST VIRGINIA
Fairmont State College
Salem College
West Virginia Institute of Technology
West Virginia State College
West Virginia University

WISCONSIN
Stout State University
University of Wisconsin
Wisconsin State University--Platteville

WYOMING
University of Wyoming

PROFESSIONAL AND RELATED OCCUPATIONS

Occupation	Estimated employment, 1968	Average annual openings to 1980[1]	Employment prospects[2]
BUSINESS ADMINISTRATION AND RELATED PROFESSIONS			
Accountants	500,000	33,000	Excellent opportunities. Strong demand for college trained applicants. Graduates of business and other schools offering thorough training in accounting should have good prospects.
Advertising workers	140,000	5,700	Many young people attracted to this field. Hence, stiff competition, but good opportunities will continue for those having college-level training in marketing, journalism, or business administration and a flair for language.
Marketing research workers	20,000	2,700	Very good opportunities for college graduates well prepared in marketing research methods and statistics. Marketing research organizations expected to expand, and many new ones will emerge.
Personnel workers	110,000	6,900	Favorable outlook. Opportunities best for college graduates. New workers needed for recruiting, interviewing, and related activities. More people will probably be engaged in psychological testing and labor-management relations.
Public relations workers	100,000	8,800	Demand expected to grow as population increases and general level of business rises. Increases in amount of funds spent on public relations will continue.
CLERGYMEN			
Protestant clergymen	244,000	11,000	Supply of well-qualified Protestant ministers will probably continue to be less than demand.
Rabbis	6,000	300	The supply of rabbis will probably be inadequate to meet expanding needs of Jewish congregations and other organizations desiring their services.
Roman Catholic priests	62,000	2,800	Growing number needed. Number of ordained priests insufficient to meet the needs of newly established parishes, expanding colleges, and institutional needs.
CONSERVATION OCCUPATIONS			
Foresters	25,000	1,000	Good opportunities. Factors contributing to increased demand are expanded need for forest products; use of forests for recreational purposes; and growing awareness of need to conserve and replenish our forest resources.
Forestry aids	13,000	900	Prospects will be especially good for those with post-high school training in a forestry curriculum.
Range managers	4,000	200	Favorable opportunities, particularly in Federal agencies. Demand will be especially good for well-qualified persons having advanced degrees to fill research and teaching positions.
COUNSELING OCCUPATIONS			
Employment counselors	5,300	700	Excellent opportunities for those having a master's degree or recognized experience in the field. College graduates with a bachelor's degree and 15 hours in counseling courses will find many opportunities as trainees in State and local employment service offices.
Rehabilitation counselors	12,000	1,050	Shortage occupation; excellent opportunities particularly for persons having graduate training in rehabilitation counseling or in related fields.
School counselors	54,000	3,800	Shortage area. Excellent opportunities. Very rapid employment increase, reflecting continued strengthening of counseling services and some increase in secondary school enrollments.
ENGINEERS	1,100,000	53,000	Very good opportunities. Applicants need to be well-grounded in fundamentals to avoid skill obsolescence.
Aerospace	65,000	1,400	Favorable opportunities and moderate increase in requirements related to continuing developments in supersonic, subsonic, and vertical lift aircraft as well as advancement in space and missile activities.
Agricultural	12,000	400	Moderate growth in demand stimulated by growing mechanization of farm operations, increasing emphasis on conservation of resources, and the broadening use of agricultural products and wastes as industrial raw materials.
Ceramic	10,000	400	Excellent opportunities for new graduates. Growth of programs related to nuclear energy, electronics, and space programs will provide many opportunities.
Chemical	50,000	1,600	Excellent opportunities. Growth factors related to expansion of the chemical industry and large expenditures for research and development.
Civil	180,000	11,500	Expanding opportunities related to growing needs for housing, industrial buildings, and highway transportation systems. Work related to urban environmental problems such as air pollution may also require additional civil engineers.

Occupation	Estimated employment, 1968	Average annual openings to 1980 [1]	Employment prospects [2]
Electrical	230,000	12,500	Rapid growth related to demand for electrical equipment to automate and mechanize production processes, especially for items such as computers and numerical controls for machine tools and for electrical and electronic consumer goods.
Industrial	120,000	7,200	Increasing complexity of industrial operations, expansion of automated processes, and continued growth of the Nation's industries are expected to increase demand.
Mechanical	215,000	8,600	Rapid employment growth due to demand for industrial machinery and machine tools and increasing technological complexity of industrial machinery and processes.
Metallurgical	6,000	300	Increasing number of workers will be needed to develop new metals and alloys as well as adapt current ones to new needs, and to solve metallurgical problems connected with efficient use of nuclear energy.
Mining	5,000	100	Growing demand, to work with newly discovered mineral deposits and devise more efficient methods to mine low grade ores, as well as develop oil shale deposits.
HEALTH SERVICE OCCUPATIONS			
Physicians	295,000	20,000	Shortage occupation. Excellent opportunities. Limited capacity of medical schools restricts supply as demand increases steadily.
Osteopathic physicians	12,000	800	Excellent job prospects. Greatest demand in areas where osteopathy is widely accepted method of treatment.
Dentists	100,000	4,900	Very good opportunities. However, limited capacity of dental schools will restrict entrants.
Dental hygienists	16,000	2,400	Demand will continue to exceed supply. Excellent opportunities, particularly for part-time workers.
Dental laboratory technicians	27,000	2,100	Very good opportunities for well-qualified technicians and trainees. Best sources for salaried jobs are commercial laboratories and the Federal Government.
Registered nurses	660,000	65,000	Current shortage; very favorable opportunities. Steadily rising demand accompanied by increasing supply, as training facilities and financial aid expand.
Licensed practical nurses	320,000	48,000	Employment opportunities will increase rapidly as these workers are utilized to a greater extent to provide increasing nursing services.
Optometrists	17,000	800	Favorable prospects. Graduates of optometry schools expected to lag behind demand.
Pharmacists	121,000	4,400	Gradual increase in new positions anticipated.
Podiatrists	8,500	200	Favorable opportunities for new graduates to establish their own practices as well as to enter salaried positions.
Chiropractors	16,000	900	Outlook favorable; uncrowded field. Prospects will be best in areas where chiropractic is most fully accepted as a method of treatment.
Occupational therapists	7,000	1,500	Shortage occupation. Public interest in rehabilitation of the disabled and the success of established therapy programs will continue to stimulate demand.
Physical therapists	14,000	2,800	Excellent prospects. Demand expected to exceed supply, as rehabilitation services expand.
Speech pathologists and audiologists	18,000	2,300	Good opportunities. Since most States require master's degree, trained applicants are in limited supply.
Medical laboratory workers	100,000	12,800	Expanding opportunities as physicians increasingly depend upon laboratory tests in routine physical checkups as well as in the diagnosis and treatment of disease. Particularly strong demand for technologists having graduate training in biochemistry, microbiology, immunology, and virology.
Radiologic technologists	75,000	7,300	Very good prospects for both full-time and part-time employment. Expansion in use of X-ray equipment in diagnosing and treating diseases strong factors underlying rise in demand.
Medical record librarians	12,000	1,400	Shortage field; very good opportunities. More hospitals and increasing volume and complexity of hospital records will contribute to growing demand.
Dietitians	30,000	2,700	Shortage occupation. Increasing opportunities for full-time and part-time work. Growth related to expansion of hospitals and nursing homes.
Hospital administrators	15,000	900	Excellent prospects for those with master's degree in hospital administration. Applicants will have difficulty entering this field without graduate training.
Sanitarians	10,000	600	Very favorable prospects as State and local health agencies expand activities in environmental health.
Veterinarians	24,000	1,400	Very good prospects. Although demand is expected to expand, supply will be restricted by limited capacities of schools of veterinary medicine.

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Occupation	Estimated employment, 1968	Average annual openings to 1980[1]	Employment prospects[2]
MATHEMATICS AND RELATED OCCUPATIONS			
Mathematicians	65,000	4,600	Favorable employment opportunities for those having graduate degrees and for well-qualified persons having bachelor's degrees.
Statisticians	23,000	1,600	Good opportunities. Widespread application of statistical methods should strengthen demand in industry, government, and in colleges and universities.
Actuaries	4,000	300	Excellent opportunities because of rising number of insurance policies. Qualified graduates who have passed some actuarial examinations will be in particular demand as trainees.
NATURAL SCIENCE OCCUPATIONS			
Geologists	22,800	800	Favorable prospects for persons who have graduate degrees; those with only the bachelor's degree, including those who rank high academically, will face some competition for the few available entry positions.
Geophysicists	6,800	300	Good job prospects especially for those having a graduate degree.
Meteorologists	4,000	200	Good opportunities. Space-age activities contributing to demand. Those with advanced degrees will be in special demand to conduct research, teach in colleges and universities, and engage in management and consulting work.
Oceanographers	5,200	500	Those with advanced degrees will have best opportunities. Growing recognition of importance of the oceans to the Nation's welfare and security has heightened interest in oceanography and has opened new fields for specialists.
LIFE SCIENCE OCCUPATIONS			
Life scientists	170,000	9,900	Very good opportunities for graduate degree holders, particularly for research in medicine, health, and environmental quality control. Those having only a bachelor's degree may work as research assistants or technicians.
Biochemists	11,000	700	Very good prospects. Ph.D.'s will be in special demand to do independent research and teach. Greatest demand for medical research.
PHYSICAL SCIENTISTS			
Chemists	130,000	8,800	Very good prospects, especially for those having advanced degrees, to teach and do research. Increased research and development expenditures will create new jobs. New products resulting from research also create other types of work.
Physicists	45,000	3,200	Favorable opportunities, particularly for those having advanced degrees. Strong demand in teaching, research, and in various science and engineering programs.
Astronomers	1,400	100	The higher level professional positions will continue to be filled mainly by persons having the doctorate. Well qualified persons having only a bachelor's or a master's degree will have good prospects primarily as research and technical assistants.
PERFORMING ARTISTS			
Actors and actresses	14,000	900	Overcrowding to persist. Applicants outnumber many times the jobs available. Moreover, many actors are employed in their profession for only a small part of the year.
Dancers	23,000	1,400	Few full-time jobs and large number of applicants. Outlook for those qualified to teach will be much better than for those trained only as performers.
Musicians and music teachers	166,000	8,600	Overcrowded field. Keen competition for performers; prospects brightest for teaching. Slight employment increase expected.
Singers and singing teachers	60,000	3,100	Keen competition for performers. Better chances for teachers. Little growth likely.
SOCIAL SCIENTISTS			
Anthropologists	3,000	200	Excellent opportunities for Ph.D.'s. Those with only the master's likely to face persistent competition.
Economists	31,000	2,200	Excellent opportunities for those having graduate degrees, particularl, in teaching and research. Applicants having B.A. degrees will find many opportunities in government and as management trainees in industry.
Geographers	3,900	200	Favorable outlook. Strong demand in teaching and research for those with graduate degrees. Government needs are related to regional development, urban and resource management planning, and interpretation of maps.
Historians	14,000	800	Excellent opportunities in teaching and archival work for Ph.D.'s. Those with only a master's or less will find positions scarce; high school teaching available for those meeting certification requirements.
Political scientists	11,400	800	Very good prospects, especially for Ph.D.'s interested in college teaching. More limited prospects for those having only a master's or less. Demand in government for work related to foreign affairs.

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Occupation	Estimated employment, 1968	Average annual openings to 1980[1]	Employment prospects[2]
Sociologists	10,000	600	Majority of new positions will be in teaching. Best opportunities for Ph.D.'s. Very good opportunities for research workers in rural sociology, community development, population analysis, public opinion research, and medical sociology.
TEACHERS			
College and university teachers	286,000	17,000	Good opportunities, especially for Ph.D.'s; many opportunities, particularly in junior colleges, for those having master's degrees. Shortages likely in some subject fields.
Kindergarten and elementary school teachers	1,230,000	56,300	Number of qualified teachers may exceed openings if present enrollment projections and trends in number of newly trained teachers continues. Greater emphasis expected to be placed on quality of applicant's training and academic achievement.
Secondary school teachers	940,000	40,000	A slowing of enrollment growth may be accompanied by an increase in college graduates trained to teach. Greater emphasis expected to be placed on type and quality of an applicant's training and academic achievement. Demand may exceed supply in some geographical areas and in some subjects.
TECHNICIANS			
Draftsmen	295,000	15,300	Favorable prospects, especially for those having post-high school drafting training. Well-qualified high school graduates in demand for some types of jobs.
Engineering and science technicians	620,000	31,000	Very good opportunities. Demand strongest for graduates of post-secondary technician training schools to fill more responsible jobs. Industrial expansion, complexity of products, and manufacturing processes increasing demand.
WRITING OCCUPATIONS			
Newspaper reporters	37,000	1,800	Good opportunities for the well-qualified who have demonstrated talent. Others face competition, especially on large city dailies. Small town papers offer most openings.
Technical writers	30,000	1,300	Very good prospects for well-qualified writers. Many opportunities for beginners having good writing ability and appropriate education.
OTHER PROFESSIONAL AND RELATED OCCUPATIONS			
Airline dispatchers	1,200	50	Little or no employment change as improved communication facilities enable dispatchers at major terminals to dispatch aircraft at other airports.
Air traffic controllers	14,600	425	Moderate employment increase, despite greater use of automated equipment, as airline traffic increases.
Architects	34,000	2,300	Good prospects in this rapidly growing field as volume of nonresidential construction expands. Demand will be stimulated also by urban redevelopment and city and community planning projects.
Broadcast technicians	20,000	400	Slight increase in employment, despite technical advances, such as automatic switching and programing, automatic operation logging, and remote control of transmitters which limit job opportunities. Color television, which requires more maintenance and skill than black and white equipment, will increase demand.
College placement officers	2,500	200	Prospects best for recent college graduates seeking beginning positions, particularly at their own alma maters. College and university emphasis on the student personnel service aspect of higher education will increase demand.
Commercial artists	50,000	1,900	Good opportunities for the talented and well trained. Young people having only average ability and little specialized training will encounter competition for beginning jobs and limited opportunities for advancement.
Flight engineers	7,500	225	Rapid increase in employment as heavier jet-powered aircraft, requiring flight engineers, come into wider use.
Ground radio operators and teletypists	8,200	225	Employment may decline somewhat because of more automatic communications equipment.
Home economists	100,000	7,800	Greatest demand will be for teachers. Increased national focus on the needs of low-income families may also increase demand.
Industrial designers	10,000	300	Employers will seek applicants with a college degree and outstanding talent. Entrants likely to encounter keen competition from creative persons with engineering, architectural, and related educational backgrounds.
Interior designers and decorators	15,000	700	Good opportunities for talented graduates. Those having no formal training will find jobs increasingly difficult to obtain.
Landscape architects	8,500	500	Profession will expand because of continued growth of metropolitan areas with their needs for parks and recreational facilities, increasing public construction including housing, and rising interest in city and regional planning.

Occupation	Estimated employment, 1968	Average annual openings to 1980 [1]	Employment prospects [2]
Lawyers	270,000	14,500	Very good prospects for graduates from widely recognized law schools and those who rank high in class. Others may encounter difficulty finding salaried jobs as lawyers. The increased use of legal services by low- and middle-income groups will add to the long-term growth in demand.
Librarians	106,000	8,200	Excellent prospects. Shortages, particularly in school libraries, expected to continue despite anticipated increase in number of library school graduates.
Models	50,000	1,700	Full-time modeling should remain highly competitive. Favorable part-time opportunities.
Photographers	60,000	2,200	Competition keen in portrait and commercial fields, but demand will continue strong for industrial photographers.
Pilots and copilots	52,000	1,800	Very rapid increase in employment to the extent that increased traffic exceeds increased carrier capacity.
Programers	175,000	23,000	Sharpest employment increase in firms using computers to process business records and control manufacturing processes. Changes in job function related to advances in techniques and equipment will eliminate much routine work. Increasing demand for qualified programers and systems analysts in science and engineering programs.
Psychologists	32,000	3,100	Excellent opportunities for those having a Ph.D. Competition likely to be keen for those having an M.A. Expansion of health services, counseling, testing, and teaching will contribute to demand.
Radio and television announcers	14,000	600	Moderate increase in employment as new radio and television stations open; however, automatic programing will limit growth. Entry jobs easier to get in radio than in television because of the greater number of radio stations, especially small ones, that hire beginners.
Recreation workers	40,000	4,100	Current shortage. Excellent opportunity for well-qualified workers, particularly in local governments, voluntary agencies, hospitals, and youth-serving organizations.
Social workers	160,000	16,700	Excellent opportunities for those having master's degree in social work; very good opportunities for those having a bachelor's degree. Many part-time jobs for qualified and experienced women.
Surveyors	45,000	2,600	Best prospects for persons having post-secondary school training in surveying. Demand will be stimulated by expanding urban and highway development.
Systems analysts	150,000	27,000	Excellent opportunities; one of fastest growing professions. Qualified workers difficult to obtain because of competition from other fields, especially mathematics and science.
Urban planners	7,000	800	Shortage of qualified planners in this small, rapidly growing field. Very good prospects with government in health planning, model cities programs, and intergovernment planning relations.

MANAGERIAL OCCUPATIONS

Bank officers	125,000	9,900	Very rapid employment increase, as banks expand. However, competition keen, as banks rely on "promotion from within" to fill most positions.
Conductors (railroad)	38,000	2,500	Despite increased freight traffic, little employment change. As passenger traffic continues to decline, freight trains get longer and yard operations become more mechanized.
Industrial traffic managers	15,000	500	Strong demand expected for specialists who know how to classify products to obtain the lowest possible freight rates, choose carriers best able to handle each shipment, and otherwise protect their companies from excessive shipping charges.
Managers and assistants (hotel)	150,000	9,500	Moderate employment increase as additional hotels, motels, and motor hotels are built. Hotel administration graduates will have advantage.
Purchasing agents	140,000	6,700	Very good opportunities. Demand strong for business administration graduates who have had courses in purchasing or engineering and science to work in firms manufacturing chemicals, complex machines, and other technical products.

CLERICAL AND RELATED OCCUPATIONS

Bank clerks	400,000	29,500	Moderate employment increase. Data processing will slow growth. Sharpest increases in clerical vocations related to data processing. Decline may occur in occupations such as check sorters and bookkeeping machine operators.
Bank tellers	230,000	20,000	Very rapid employment growth as banks expand services to urban population. Increasing proportion will be part-time tellers for peak hours.
Bookkeeping workers	1,200,000	78,000	Demand expected to outpace labor-saving impact of office machines.
Cashiers	730,000	69,000	Opportunities best for persons having typing, bookkeeping, or other special skills. Many opportunities for part-time workers.

Occupation	Estimated employment, 1968	Average annual openings to 1980 [1]	Employment prospects [2]
Clerks (railroad)	93,000	2,700	Continued decline in employment as electronic business machines process freight bills and record freight car movements.
Dental assistants	100,000	9,000	Excellent opportunities, especially for graduates of academic programs.
Electronic computer operating personnel	175,000	20,400	Although staff required to operate a computer installation may be reduced as new equipment is developed, total number of computer and auxiliary operators expected to increase very rapidly.
Front office clerks (hotel)	50,000	3,200	Moderate increase in employment as number of hotels, motels, and motor hotels increases.
Library technicians	70,000	9,000	Outlook excellent, particularly for graduates of academic programs. The continuous shortage of professional librarians contributes to very rapid growth.
Mail carriers	246,000	12,200	Rapid employment increase as populations spread into suburban areas. Increasing use of motor vehicles will limit growth somewhat.
Office machine operators	325,000	25,000	Rapid increase despite automated recordkeeping systems, advances in interoffice communications, devices for transmitting data, and electronic computer technology, which permit centralized recordkeeping.
Postal clerks	290,000	14,600	Rapid employment growth resulting from increases in population and business. However, employment expected to grow more slowly than mail volume because of technological developments.
Receptionists	240,000	30,000	Despite rapid increase, young applicants will face keen competition from older and more experienced workers. Unlikely to be affected by automation because work is of a personal nature.
Shipping and receiving clerks	370,000	12,400	Employment will not increase as fast as the volume of goods distributed. Laborsaving equipment enables large firms to handle a greater volume of merchandise, using fewer clerks.
Station agents (railroad)	10,900	—225	Decline in employment as railroads discontinue or consolidate passenger and freight services. However, trend may be slowed if rapid transit rail systems are developed on large scale.
Stenographers and secretaries	2,650,000	237,000	Very good opportunities. Increasing use of dictating, duplicating, and other office machines is not expected to affect growth greatly.
Telegraphers, telephoners, and towermen (railroad)	13,200	100	Declining employment resulting from mechanization of yard operations, new communications devices, and extension of centralized traffic control.
Telephone operators	400,000	28,000	Direct dialing and other automatic devices will offset employment impact of expanding business. Most growth will be in PBX installations where technological advances are minimal.
Traffic agents and clerks (civil aviation)	37,500	2,600	Rapid employment increase, mainly because of anticipated growth in air passenger and cargo traffic. Mechanization of reservation processing and recordkeeping will limit growth of clerical jobs.
Typists	700,000	63,000	Very good opportunities. Demand strongest for typists to do difficult work in senior jobs and for those combining typing and other office work.

SALES OCCUPATIONS

Occupation	Estimated employment, 1968	Average annual openings to 1980 [1]	Employment prospects [2]
Insurance brokers and agents	410,000	16,200	Field will remain keenly competitive despite expected increase in number of insurance policies issued.
Manufacturers' salesmen	500,000	32,000	Very good opportunities for well-trained workers, but employers will be selective. Demand strong for those trained to handle technical products.
Real estate salesmen and brokers	225,000	14,200	Many new positions will be created to serve growing population, but most openings will result from turnover.
Retail trade salesworkers	2,800,000	150,000	Many opportunities for full- and part-time work. Employment will increase more slowly than volume of sales. Most demand for workers who are well informed about their merchandise and skilled in salesmanship.
Automobile parts countermen	65,000	2,500	Continued employment growth related to increasing number of motor vehicles and a growing variety of replacement parts.
Automobile salesmen	120,000	4,400	Employment fluctuates, but tends to be more stable than car sales, which are affected by general business conditions, consumer preference, and availability of credit. Sales of new and used cars will increase as a result of increases in driving age population, multiple car ownership, and personal income.
Automobile service advisors	10,000	300	Complexity and larger number of cars expected to increase employment in this relatively small occupation.
Securities salesmen	135,000	7,400	Good opportunities. Many new and replacement openings for salesmen to serve growing number of individuals and institutions investing in securities.

Occupation	Estimated employment, 1968	Average annual openings to 1980[1]	Employment prospects[2]
Wholesale trade salesworkers	530,000	25,200	Good opportunities. Demand will be stimulated by increase in business transacted and specialized services offered by wholesale houses.
SERVICE OCCUPATIONS			
Barbers	210,000	12,800	A growing population and the trend toward hair styling for men will create many new jobs. Shops having one or two barbers will probably remain most common.
Bellmen and bell captains (hotel)	30,000	1,100	Although many new hotels, motels and motor hotels will be built, employment expected to increase only slightly because of the type of construction and the emphasis on informality. Keen competition for the few bell captains' jobs that become available.
Building custodians	1,100,000	80,000	Very favorable opportunities despite improvements in cleaning maintenance technology which reduces the time needed to perform tasks.
Cooks and chefs	670,000	48,000	Excellent opportunities. Small establishments offer most opportunities for beginners. Acute shortage of skilled cooks and chefs.
Cosmetologists	475,000	38,000	Very good opportunities. Employment will rise because of increase in population and more frequent use of beauty salons.
FBI special agents	6,600	(3)	Employment expected to rise with growing FBI responsibilities. Turnover rate traditionally low.
Firefighters	180,000	7,700	Many new jobs created, as city fire departments enlarge staffs and as paid firefighters replace volunteers.
Licensed practical nurses	320,000	48,000	Opportunities will increase rapidly as these workers are utilized more commonly to fill demand for nursing services.
Hospital attendants	800,000	100,000	Very rapid rise in employment. Most openings will be in hospitals, but many will be in nursing and convalescent homes and other long-term care facilities.
Housekeepers and assistants (hotel)	25,000	2,400	Increase in employment related to growing number of hotels, large motor hotels, and luxury motels. Established hotels fill most openings by promoting assistant housekeepers and maids.
Police officers (municipal)	285,000	15,000	Very good opportunities although future jobs are likely to be affected by current changes in police methods and equipment. Specialists becoming more essential.
Private household workers	1,700,000	121,000	Large number of openings. Demand stimulated by rising family incomes and larger number of women working outside the home.
State police officers	35,000	2,800	Opportunities excellent. Number of applications restricted in some States by State Civil Service and other entry requirements.
Stewardesses (civil aviation)	25,000	(3)	Very rapid increase expected because of more air travel and high turnover; 30 percent of stewardesses leave jobs each year.
Waiters and waitresses	960,000	67,000	Employment will increase rapidly despite growth in use of vending machines.
CRAFTSMEN			
BUILDING TRADES			
Asbestos and insulating workers	22,000	800	Moderate employment increase as construction expands and industrial pipe is used more widely in manufacturing.
Bricklayers	175,000	7,600	Moderate employment increase, as construction expands and more structural and ornamental brick is used.
Carpenters	869,000	39,300	Moderate employment increase resulting from large rise in construction activity, but growth will be limited by technological developments.
Cement masons (cement and concrete finishers)	60,000	3,600	Rapid employment increase resulting from rapid expansion of construction and growing use of concrete and concrete products.
Electricians (construction)	190,000	10,500	Very rapid increase in employment expected in construction requiring electrical wiring for appliances, air-conditioning systems, electronic data processing equipment, and electrical control devices.
Elevator constructors	14,500	500	Slow employment increase. Some workers needed as industrial and commercial building activity expands and old structures are modernized.
Floor covering installers	37,000	1,700	Moderate employment increase resulting from expansion of construction activity and wider use of resilient floor coverings and wall-to-wall carpeting.
Glaziers	9,000	500	Very rapid increase in employment. Expansion of construction activity and the increasing use of glass in building construction will create very favorable long-range outlook.
Lathers	30,000	1,250	Moderate increase related to anticipated growth in construction and to new kinds of plaster that require lathing.
Operating engineers (construction machinery operators)	285,000	16,200	Very rapid employment growth resulting from increasing use of machinery for construction, particularly for highways.
Painters and paperhangers	430,000	23,200	Expected increase in construction points to moderate employment increase for painters. Painters also needed in maintenance and in use of such new materials as polyester and vinyl coatings and epoxys.

Occupation	Estimated employment, 1968	Average annual openings to 1980[1]	Employment prospects[2]
Painters and paperhangers—Con.			Moderate employment increase for paperhangers because of wider use of fabric, plastic, and other wall coverings. Use of interior wall paint and wallpapers for "do-it-yourselfers" will limit growth.
Plasterers	40,000	1,150	Moderate increase resulting from growth in construction. New materials and methods have expanded use of plaster; but drywall construction will limit employment growth.
Plumbers and pipefitters	330,000	19,500	Rapid growth, as construction increases. Maintenance, repair, and modernization of existing plumbing and heating systems will create additional jobs.
Roofers	55,000	3,000	Rapid increase resulting mainly from construction growth. Technological innovations may limit growth somewhat.
Sheet-metal workers	50,000	2,500	Very rapid increase, due to expansion of construction that will use air-conditioning and refrigeration systems.
Stonemasons, marble setters, tile setters, and terrazzo workers	30,000	850	Little employment increase for stonemasons, due to decline of stonemasonry in modern architecture. Little change for marble setters. Moderate increase for tile setters, limited by increasing use of competing materials. Rapid increase for terrazzo workers due to expanding use of terrazzo materials.
Structural-, ornamental-, and reinforcing-iron workers; riggers; and machine movers	75,000	3,900	Rapid increase, as a result of expected growth of construction and because metals are expected to become more competitive with other building materials.
All-round machinists[4]	400,000	12,600	Slow employment increase, with most openings resulting from need for replacements.
Layout men	(3)	(3)	Little or no change expected because of increasing use of numerically controlled machines.
Instrument makers—mechanical	(3)	(3)	Rapid increase, as result of growing use of instruments in manufacturing, research and development, and metalworking.
Setup men (machine tools)	70,000	2,600	Moderate increase, as a result of anticipated expansion of metalworking activities. Numerically controlled machine tools may change job duties.
Tool and die makers	150,000	3,700	Despite technological advances in toolmaking, employment is expected to increase slowly because of anticipated long-range expansion of metalworking industries.
Air-conditioning, refrigeration, and heating mechanics	100,000	5,000	Continued fast growth of home air-conditioning will contribute to very rapid employment increase for air-conditioning mechanics. Oil burner mechanics may find openings limited, since relatively few new homes have oil heating systems.
Aircraft mechanics	135,000	9,700	Rapid increase due to substantial increase in the number of aircraft in operation.
Appliance servicemen	205,000	8,600	Rapid increase because of the larger number of household appliances. Increased efficiency of service will limit growth.
Automobile body repairmen	100,000	3,550	Moderate increase, primarily as a result of growing number of motor vehicle accidents.
Automobile mechanics	615,000	20,000	Moderate increase as a result of more automobiles and their new features such as air-conditioning, power steering, power brakes, and devices that reduce exhaust fumes. Greater shop efficiency will limit growth.
Bowling-pin machine mechanics	6,500	50	Little or no employment change. Despite growing popularity of bowling, improvements in manufacture of pinsetting machines result in fewer repairs.
Business machine servicemen	115,000	8,500	Outlook particularly favorable for those who have good mechanical ability and knowledge of electricity or electronics.
Electric sign servicemen	6,100	300	Rapid increase despite trend toward illuminated plastic signs.
Farm equipment mechanics	40,000	1,100	Slow increase due to declining number of farms and increased reliability of farm machinery.
Industrial machinery repairmen	175,000	7,550	Moderate increase as result of anticipated use of more machinery and equipment to fabricate, process, assemble, inspect, and handle industrial production materials.
Instrument repairmen	85,000	4,600	Very rapid increase because the use of instruments for scientific, industrial, and technical purposes will increase.
Maintenance electricians	240,000	9,900	Moderate increase because of growing volume of electrical and electronic equipment.
Millwrights	75,000	2,400	Slow increase, related to new plants, additions of new machinery, changes in plant layouts, and maintenance of increasing amounts of heavy equipment.
Television and radio service technicians	125,000	3,000	Moderate increase related to growing number of radios, television receivers, phonographs, and other home entertainment products.

Occupation	Estimated employment, 1968	Average annual openings to 1980[1]	Employment prospects[2]
Truck mechanics and bus mechanics	110,000	2,900	Moderate increase resulting from more freight transportation by truck. Favorable effect of increased intercity bus travel is expected to be offset by declining local bus transit.
Vending machine mechanics	16,000	650	Moderate increase of qualified mechanics, resulting from expansion of automatic merchandising.
Watch repairmen	20,000	1,400	Inadequate supply of skilled workers expected to continue. Well-trained workers in demand to produce miniaturized devices, especially in industries making scientific instruments and electronics.
PRINTING (GRAPHIC ARTS) OCCUPATIONS			
Bookbinders and related workers	30,000	400	Some employment decrease despite anticipated growth of bound printed material, because of increasing mechanization of bindery operations.
Composing room occupations	190,000	3,200	Slow decline caused by technological changes, despite greater volume of printing. Knowledge of electronic principles increasingly important for operation of new typesetting equipment.
Electrotypers and stereotypers	8,000	—25	Moderate decline caused by technological change, despite increased printing volume.
Lithographic occupations	73,000	1,800	Slow increase despite expansion of offset printing. Technological developments expected to slow employment increase.
Photoengravers	18,000	300	No increase despite growing use of photographs and other illustrations and increasing use of color. Technological change in etching and engraving and greater use of offset printing will limit growth.
Printing pressmen and assistants	90,000	2,850	Moderate increase as volume of printing and use of color expands, requiring larger and more complex presses. Technological improvements will limit growth.
TELEPHONE INDUSTRY OCCUPATIONS			
Central office craftsmen	80,000	2,700	Moderate employment increase, resulting mainly from greater demand for telephone service and data communication systems. Electronic and automatic devices will restrict growth.
Central office equipment installers	22,000	400	No change in employment; however, increasingly complex central office equipment will require manpower having more and higher skills in electronics.
Linemen and cable splicers	40,000	600	Trends will differ among individual occupations. Very small growth is expected in number of cable splicers because of technological developments that increase worker efficiency. Employment of linemen not expected to increase significantly because of increased mechanization.
Telephone and PBX installers and repairmen	86,000	3,000	Moderate increase. Growing number of telephones and specialized equipment expected to cause some growth in volume of service.
OTHER CRAFT OCCUPATIONS			
Automobile trimmers and installation men (automobile upholsterers)	8,000	350	Moderate employment growth because of increased demand for custom-made automobile upholstery and other fabric products.
Blacksmiths	15,000	500	Slow decline because work formerly done by blacksmiths is increasingly done by other workers such as forge-shop craftsmen and welders, and because replacing small articles is cheaper than repairing them.
Boilermaking occupations	25,000	1,000	Moderate increase mainly because of expansion in industries that use boiler products, as well as increasing use of complex custom-made boilers.
Dispensing opticians and optical mechanics	22,000	500	Moderate increase in employment of dispensing opticians resulting from increased production of prescription lenses. However, little or no employment change for optical mechanics because of more efficient production methods and improved equipment.
Foremen	1,444,000	56,200	Moderate increase. But very rapid growth for construction foremen, and rapid growth in nonmanufacturing industries.
Furniture upholsterers	32,000	800	Shortage of trained workers expected to continue.
Jewelers and jewelry repairmen	25,000	200	Shortage of workers expected to continue.
Locomotive engineers	35,000	1,350	Slow decline in employment, due to continuation of decline in passenger business and increasing multiple-unit operation of diesel locomotives.
Motion picture projectionists	16,000	750	Slow increase because of expected slight increase in number of motion picture theaters. Competition for openings likely to continue.
Shoe repairmen	30,000	1,500	Shortage expected to continue. Growth limited by popularity of footwear that cannot be repaired easily or is very durable.
Shop trades (railroad)	87,000	2,250	Decline, despite the need for more rolling stock to handle the anticipated increase in freight traffic.
Stationary engineers	260,000	7,050	Slow increase, as improved equipment and better worker utilization limit the growth from continued use of large stationary boilers, refrigeration, and air-conditioning equipment in factories, powerplants, and other buildings.

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Occupation	Estimated employment, 1968	Average annual openings to 1980[1]	Employment prospects[2]
OPERATIVES			
DRIVING OCCUPATIONS			
Busdrivers, intercity	24,000	900	Moderate employment increase as a result of more intercity bus travel. Charter service, bus delivery of package express and first-class mail, and further curtailment of railroad service will increase intercity bus traffic.
Busdrivers, local transit	65,000	500	Little employment change expected as more people drive automobiles.
Routemen	235,000	3,800	Employment, which declined during the 1950's, will increase slowly as demand rises for suburban deliveries.
Taxi drivers	85,000	1,200	Although number of drivers is declining, high turnover results in need for many replacements.
Truckdrivers, local	1,200,000	37,000	Moderate increase because of anticipated increase in volume of freight as total business activity rises.
Truckdrivers, over-the-road	640,000	21,600	Moderate rise. As commercial and industrial activity grows and industry continues to decentralize, intercity freight will increase.
OTHER OPERATIVE OCCUPATIONS			
Assemblers	785,000	26,000	Slow increase in employment as technological developments curb growth. Many replacements needed, however.
Automobile painters	30,000	1,200	Moderate increase resulting from larger number of motor vehicle accidents.
Brakemen (railroad)	74,000	1,000	Declining employment as railroad yards become more mechanized. Some replacement opportunities.
Electroplaters	13,000	600	Moderate increase, related to long-run expansion in metalworking and machinery industries and use of electroplating processes on more metals and plastics. Continuing mechanization and reassignment of duties to other workers will limit growth.
Gasoline service station attendants	400,000	10,900	Moderate increase resulting from growing consumption of gasoline and other service station products and services.
Inspectors (manufacturing)	585,000	19,200	Slow increase. Use of mechanized and automatic inspection equipment will offset rising need for inspectors.
Machine tool operators	500,000	10,500	Little change despite anticipated expansion of metalworking activities. Technological developments, including numerically controlled machine tools, will affect number and skills of machine tool operators.
Meat cutters	200,000	4,500	Little or no increase as technological developments increase worker productivity. Nevertheless, many replacement opportunities.
Photographic laboratory occupations	30,000	1,600	Moderate increase tied to growth of amateur, business, and government photography. However, greater use of improved mechanized film processing equipment will keep employment from growing as fast as volume of processing.
Power truck operators	163,000	4,100	Increase will be slow, as more efficient power trucks and other mechanized materials-handling equipment are developed.
Production painters	160,000	4,000	Employment to remain relatively stable as increasing use of mechanized and automatic equipment offsets rising demand for painting services.
Signal department workers (railroad)	12,100	—450	Slow decline as improved signaling and communications systems require less maintenance and repairs.
Stationary firemen (boiler)	73,000	—600	Employment expected to decrease moderately as result of more automatic, centralized equipment.
Waste water treatment plant operators	23,500	2,500	Rapid increase as result of construction of new treatment plants for industrial and domestic waste water.
Welders and oxygen and arc cutters	480,000	23,000	Rapid increase as a result of favorable long-run outlook for metalworking industries and wider use of welding.
LABORERS (NONFARM)			
Bridge and building workers (railroad)	11,200	275	Decline in employment expected to continue because of the increased use of power tools and other labor-saving equipment and of new materials that require less maintenance and repair.
Track workers (railroad)	57,000	1,300	Employment decline, as mechanized equipment and new materials reduce number of men employed in maintenance-of-way work.
Construction laborers and hod carriers	750,000	29,000	Some growth will result from increased construction, but use of mechanized equipment will limit opportunities.

[1] Due to growth and death, retirement, and other separations from the labor force. Does not include transfers out of the occupation.

[2] The Bureau of Labor Statistics assessment of the 1980 occupational and industry outlook is based on a projected labor force of 100.7 million in 1980, Armed Forces of 2.7 million, and a resulting civilian labor force of 98 million. The employment outlook presented in the *Handbook* also assumes

a. maintenance of high levels of employment through the 1970's,
b. that no major event will alter economic growth substantially,
c. that economic and social patterns and relationships will change at about the same rate as in the recent past,
d. that scientific and technological advancement will continue at about the same rate as in recent years, and
e. that defense expenditures in 1980 will approximate the 1963 level which is somewhat higher than the levels before the Viet Nam buildup.

[3] Estimate not available.

[4] Includes layout men and instrument men.

"Occupational Outlook Handbook in Brief," 1970-71 Edition, Occupational Outlook Quarterly, Volume 14, Number 2, Summer 1970, pp. 8-17.

A GUIDE FOR THE TRANSFER STUDENT

INDUSTRIAL EDUCATION DEPARTMENT

WESTERN MICHIGAN UNIVERSITY
KALAMAZOO, MICHIGAN 49001

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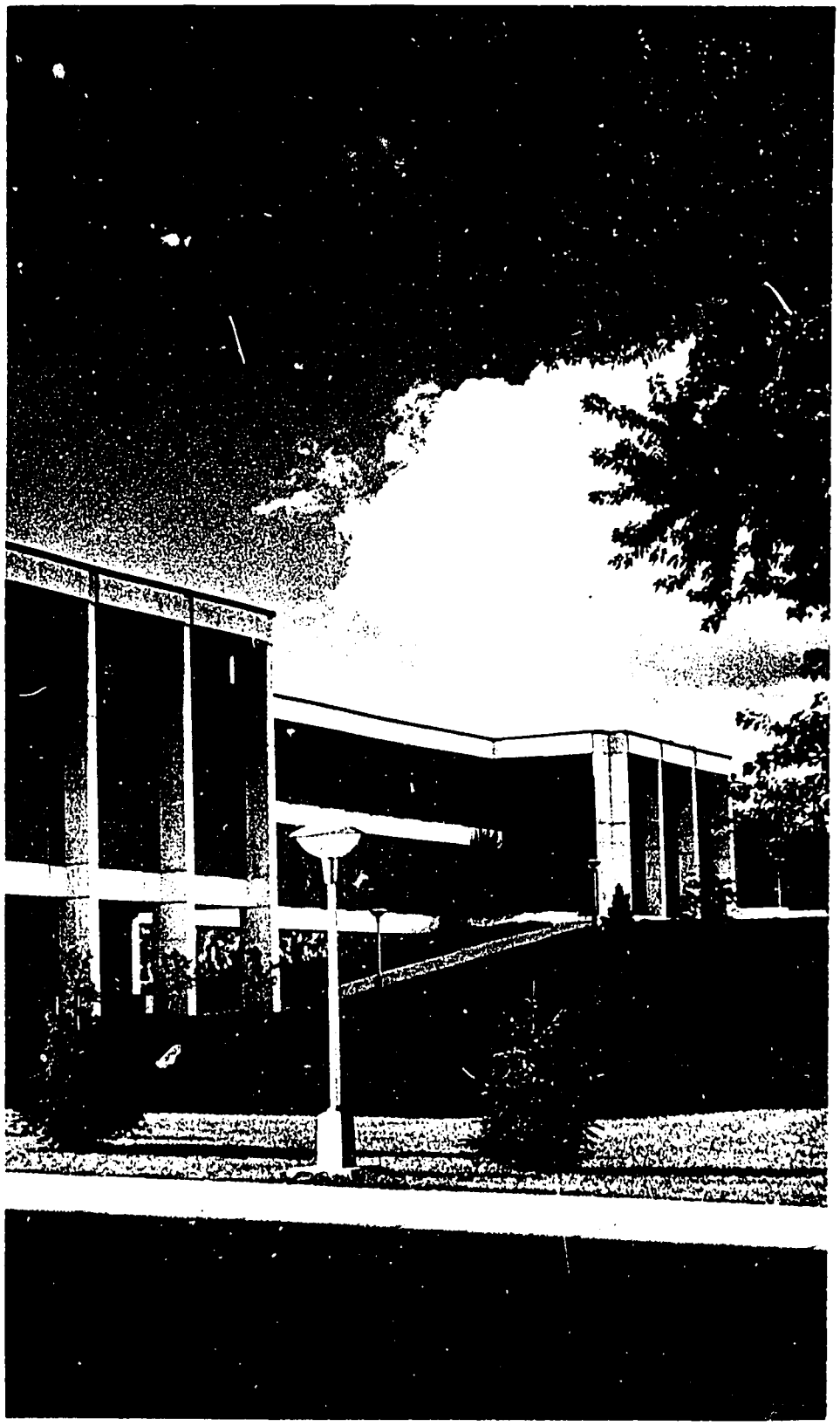

industrial engineering & technology
western michigan university

A GUIDE FOR THE TRANSFER STUDENT

Conclusions and recommendations presented in this booklet are based upon the extensive research conducted as a part of the research study titled, "Development of Junior/Community College Curricula for Future Teachers of Industrial Education," USOE Sponsored Project No. 7-0074, Grant No. OEG-0-8-070074-3713 (085).

Much of the specific material is the result of comments made by a representative group of counselors and deans of technical studies of community/junior colleges at a work/study conference held on the campus of Western Michigan University in October, 1970. The content has also been reviewed by representative professional personnel in community/junior colleges and senior institutions in various states.

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CONSULTANTS/Bruce Kocher and Dennis Wilson

DESIGN AND PRINTING/James Ulmer, Michael Davis and Douglas Cox

PHOTOGRAPHY/Robert G. Rubom and James Smith

PROJECT CO-DIRECTORS/John Feirer and John Lindbeck

PROJECT OFFICER/Elizabeth Simpson

SECRETARY/Judith Triemstra

to the student . . .

The Industrial Education Department at Western Michigan University welcomes you as a prospective student. We know that, if you select industrial education as a career, you will find it a rewarding and interesting life. We will look forward to having you on our campus. You will find all staff members willing to give you any help you may need to reach your educational objective.

what are you going to do for a living?

Right now, most of you are enrolled in a technology program and your original objective was to go into industry as a technician. But have you ever thought about becoming an industrial education teacher? What finer occupation could there be than preparing the youth of today for tomorrow. Today, there is a great need for thousands of additional industrial education teachers. If you are thinking about completing a degree at a senior institution, you should seriously consider becoming an industrial education teacher. The fact that you are already enrolled in a technology program indicates that you are already interested in the world of work. If you also like to work with young people, then you may want to become a teacher of students who badly need training so they will be able to earn a living.

what is industrial education?

Industrial education today is a study of the industry and technology of our country dealing with such subjects as building construction, drafting, electronics, graphic communications, metallurgy, and power. Actually, the term industrial education includes instruction in industrial arts, technical, and vocational/industrial education. (See Figure One.)

INDUSTRIAL ARTS is a general study of industry and technology including its tools, materials, products, processes, and occupations.

TECHNICAL EDUCATION is concerned with programs to prepare technicians.

VOCATIONAL/INDUSTRIAL EDUCATION, or trade and industrial, is a branch of vocational education which is concerned with preparing people for initial employment or for upgrading or retraining workers in a wide range of trades and industrial occupations.

how can i become an industrial education teacher?

You can become an industrial arts teacher with a four-year college degree and no work experience. Many industrial arts teachers do, however, gain work experience over a number of years and then become certified to teach in vocational programs. Others obtain their work experience before they attend college and enroll in a vocational/industrial teacher education program. Many of these programs also provide some opportunity to gain work experience while attending college.

To become a vocational/industrial teacher, you will need several years of work experience in the area in which you plan to teach and be certified as a vocational teacher. Each state indicates in its state plan for vocational education the exact amount of industrial experience needed. In Michigan, you must have two years of experience in the subject area in which you plan to teach. For example, if you want to become an automechanics teacher, the experience must be in this area. Work experience in a department store would not count.

To become a technical teacher in a community/junior college or senior institution, you will normally need at least a master's degree plus industrial work experience, as specified by the employing institution.

what are the job opportunities?

It has been estimated that during the next five years there will be a need for another 100,000 industrial education teachers. The major job opportunities are as follows:

INDUSTRIAL ARTS IN THE JUNIOR HIGH OR MIDDLE SCHOOL – A typical teaching assignment includes courses in general industrial arts (some work in drawing, electricity, graphic arts, metal, power, and wood) or courses such as communications, construction, energy and power, general industry, and manufacturing.

INDUSTRIAL ARTS IN THE SENIOR HIGH SCHOOL – Typical teaching assignment includes specific courses in automechanics, building construction, drafting, electricity/electronics, graphic arts, metalworking, plastics, woodworking, and many others.

VOCATIONAL/INDUSTRIAL (T & I) AT THE UPPER SENIOR HIGH SCHOOL, AREA VOCATIONAL SCHOOL, OR VOCATIONAL DIVISION OF THE COMMUNITY/JUNIOR COLLEGE – Typical teaching assignment: teach courses in carpentry, machine shop, welding, etc., or related subjects in mathematics and science.

TECHNICAL EDUCATION IN TECHNICAL INSTITUTES AND COMMUNITY/JUNIOR COLLEGE – Courses taught in the area of specialty, such as drafting, electronics, fluid power, metallurgy, quality control, and others.

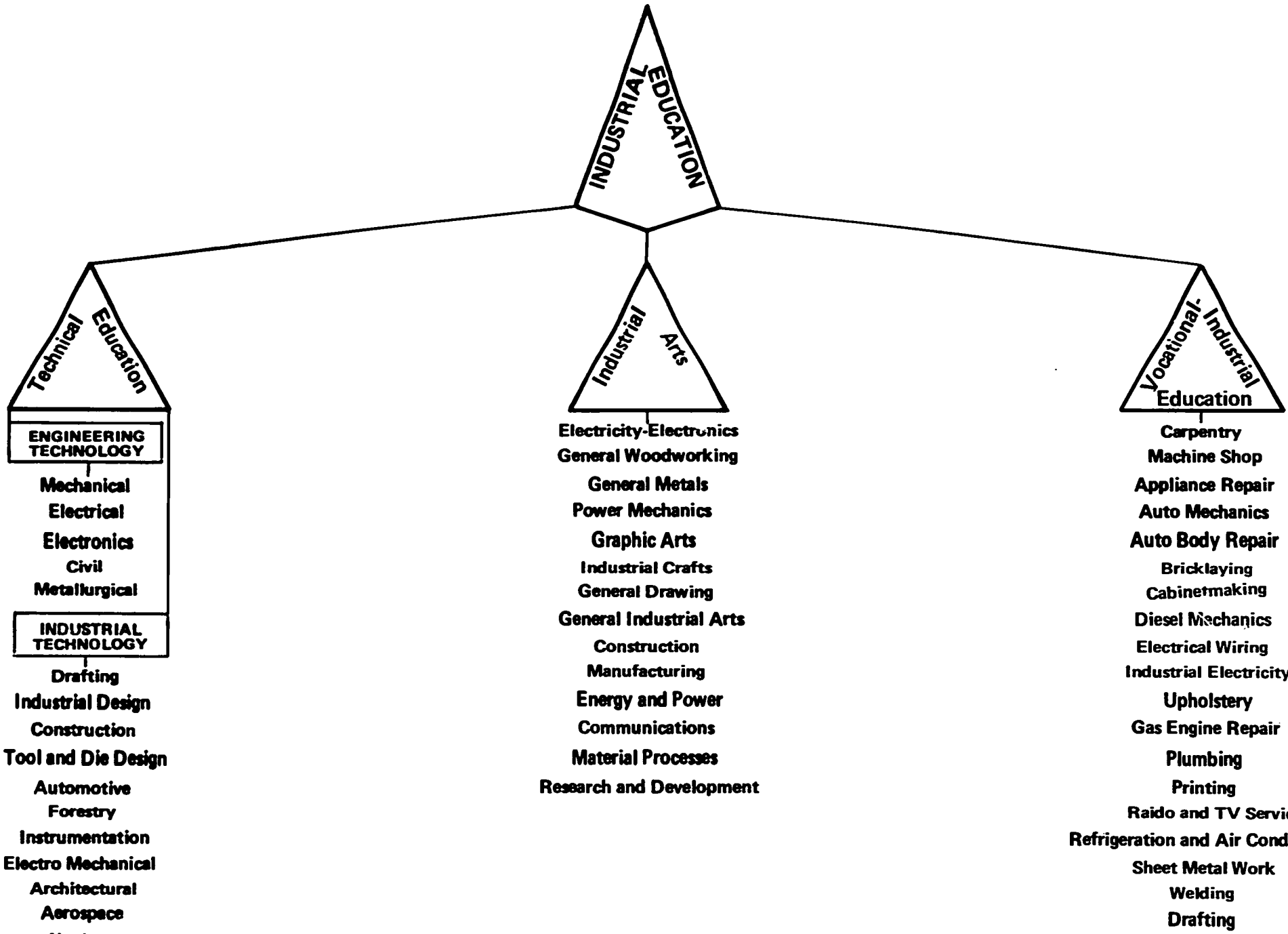
INDUSTRIAL EDUCATION
Technical Education
ENGINEERING TECHNOLOGY
Mechanical
Electrical
Electronics
Civil
Metallurgical
INDUSTRIAL TECHNOLOGY
Drafting
Industrial Design
Construction
Tool and Die Design
Automotive
Forestry
Instrumentation
Electro Mechanical
Architectural
Aerospace
Nuclear
Production
Printing
Industrial Arts
Electricity-Electronics
General Woodworking
General Metals
Power Mechanics
Graphic Arts
Industrial Crafts
General Drawing
General Industrial Arts
Construction
Manufacturing
Energy and Power
Communications
Material Processes
Research and Development
Vocational-Industrial Education
Carpentry
Machine Shop
Appliance Repair
Auto Mechanics
Auto Body Repair
Bricklaying
Cabinetmaking
Diesel Mechanics
Electrical Wiring
Industrial Electricity
Upholstery
Gas Engine Repair
Plumbing
Printing
Raido and TV Service
Refrigeration and Air Conditioning
Sheet Metal Work
Welding
Drafting

FIGURE ONE

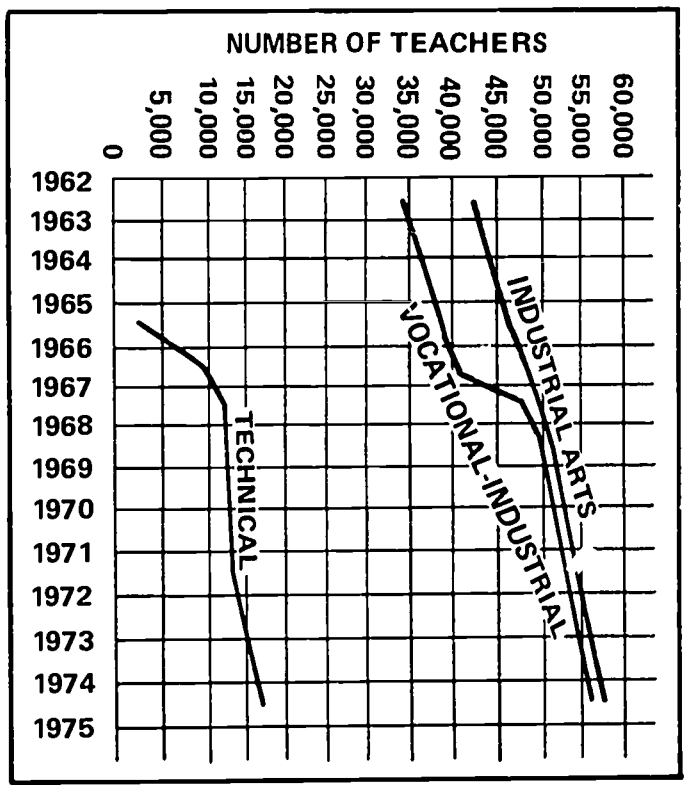

FIGURE TWO

Total Number of Industrial Arts, Vocational/Industrial, and Technical Education Teachers (USOE)

what factors should i consider before deciding whether to become an industrial education teacher?

In considering an industrial teaching career, you should ask these questions of yourself:

WILL IT BE SOMETHING I ENJOY DOING?
If you like to work with ideas, machines, tools, and with people, then you will find industrial education teaching enjoyable.

HOW MUCH EDUCATION DO I NEED?
You will need to complete a B.S. degree in a senior institution. If you plan well, the first two years of your community/junior college work can be transferred without any loss of credit. If you plan to transfer, it is important that you see your counselor at the community/junior college during your freshman year and also the counselor at the senior institution as soon as possible. Teachers must also take additional work beyond the bachelor's degree to secure permanent certification. Most school salary schedules provide for increases with additional education and with specific increases when you obtain a master's, specialist's, or doctoral degree.

WHAT WILL BE MY FINANCIAL REWARDS?
Salaries for teachers have increased substantially in recent years and are comparable to those of professional positions in industry. Because the federal government is investing so many millions of dollars in manpower training and vocational education, there is every assurance that the demand for industrial education teachers will continue.

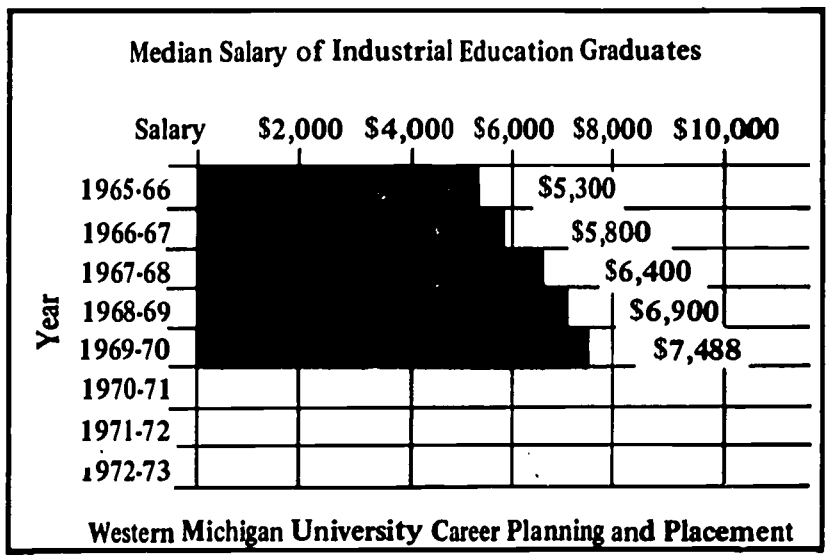

FIGURE THREE

IN WHICH AREA OF THE COUNTRY WOULD I LIKE TO LIVE?
One of the advantages of becoming an industrial education teacher is that there is an opportunity to move to almost any part of the United States to secure a job. Large cities, such as Chicago, Los Angeles, Miami, and New York continue to experience shortages of industrial education teachers. There are also many opportunities in small towns or rural areas. In fact, there are openings in every state and cities of all sizes. There is also a great need for teachers who are interested in working with the disadvantaged, particularly in the large inter-city systems.

WHAT WILL MY WORKING CONDITIONS BE LIKE?
An interesting facet of teaching industrial education is that you teach in informal, laboratory-type situations where you can work directly with your student in "hands-on" experiences with equipment, machines, and tools.

WILL A TEACHING CAREER PERMIT ME TIME FOR HOBBIES AND LEISURE ACTIVITIES?
Teaching offers you many opportunities to carry on with your own hobbies and interests. It also offers reasonable working hours and satisfactory vacations. The extended summer vacation period permits you to engage in travel and challenging summer work.

HOW CAN I PREPARE MYSELF FOR ADVANCED POSITIONS?
One of the keys to successful teaching is a willingness to continue your education after graduation from college. There are many opportunities to attend conferences, seminars, summer schools, and have other experiences that will improve your teaching competency and qualify you for better paying and more challenging positions. You will also want to complete advanced degrees.

WHERE CAN I ACQUIRE THE EDUCATION NECESSARY TO PREPARE ME AS A TEACHER?
There are approximately 230 colleges and universities in the United States that offer degrees in industrial education. Seven schools in Michigan offer undergraduate degrees. In making your choice, you should consider the answers to these questions:

Does the School Offer a Course of Study That Will Lead To Employment in My Field of Interest?
As an undergraduate student at WMU, you may major in any one of the following fields:
Drawing (Industrial Graphics)
Electricity/Electronics
General Industrial Arts
Graphic Arts
Metalworking
Power Mechanics-Automotive
Woodworking

An example of the undergraduate courses and curricula you can take, follows. Half of your technical work can be taken at the community/junior college before you transfer to WMU.

undergraduate courses

Drawing (Industrial Graphics)

Survey of Drafting
Industrial Graphics
Technical Sketching
Advanced Industrial Graphics

Electricity/Electronics

Basic Electricity
Electronic Servicing Techniques
Laboratory Practices in Electricity/Electronics

General Industrial Arts

Industrial Crafts Techniques
General Plastics
Plastics Production Processing
Industrial Arts Design
Organizing and Administering the General Shop

Graphic Arts and Printing Management

Graphic Arts
Letterpress Presswork
Typographic Design
Science for the Graphic Arts
Machine Composition
Photolithographic Techniques
Lithographic Presswork
Printing Machine Maintenance
Advanced Presswork
Printing Processes
Estimating
Bindery Operations

Metal Work

General Metals
Machine Shop
Machine Tool Metalworking
Tooling and Production Metalworking
Metal Forming and Finishing
Patternmaking and Foundry
Hot Metalworking
Advanced Metalworking

Power Mechanics-Automotive

Power Mechanics
Applied Energy and Power
Auto Mechanics for Teachers

Woodworking

General Woodworking
Machine Woodwork
Wood Finishing
Upholstering and Woodturning
Residential Building Construction

Professional Courses in Industrial Education

American Industry
Course Planning and Construction
Teaching of Industrial Education
Plan and Organization of a School Shop
Independent Study in Industrial Education

curricula . . .

The curriculum consists of laboratory and professional training designed for:

1. Industrial Arts Teaching
You will be prepared to teach industrial arts in the middle, junior, senior, or secondary school.

Curriculum requirement:
30-hr. General Industrial Arts Major or
Technical Area Major

20-hr. General Industrial Arts Minor or
Technical Area Minor

30 hrs. Teacher and Professional Industrial Education Courses

40 hrs. General Studies (Math 100, General Studies Elective)

4 hrs. Physical Education

124 hrs. (Minimum)

2. Vocational/Technical Education
You are prepared to teach vocational/industrial and/or technical courses in the secondary and post-secondary schools.

Curriculum requirement:
30-hr. Technical Major

20-hr. Technical Minor

28 hrs. Option I, (Vocational/Industrial Education leading to Secondary Teaching Certificate) Teacher and Professional Industrial Education Courses

OR

30 hrs. Option II, (Industrial Cooperative Education leading to Secondary Teaching Certificate) Teacher and Professional Vocational Education Courses

OR

30 hrs. Option III, (Technical Education without teaching certificate) Education, Supervision, and Electives

40 hrs. General Studies

8 hrs. Mathematics

4 hrs. Physical Education

130 hrs. (Minimum)

3. Industrial Education General Curriculum (non-teaching)
If you wish to secure a broad general industrial background, then you should choose this curriculum. The combination of courses you take will be decided in consultation with the counselor for this curriculum. (See the Industrial Arts Teaching Curriculum for General Studies and Physical Education Requirements.)

4. Printing Management
You will be prepared for upper supervisory or mid-management positions in the graphic arts industries.

Curriculum requirement:
33 hrs. Graphic Arts

18 hrs. Industrial Supervision

15 hrs. Business

40 hrs. General Studies

4 hrs. Mathematics (Algebra 100)

4 hrs. Physical Education

10 hrs. Electives to be selected from among the following areas: Art, Business Administration, Economics, Industrial Education, Industrial Engineering, Industrial Supervision, Language Studies, Mathematics, or Writing.

124 hrs. (Minimum)

5. Industrial Arts Therapy
You will be prepared to teach industrial arts in therapeutic and rehabilitation programs in public or private institutions. In this curriculum, it is necessary for you to have a general industrial arts major or minor and/or a technical major or minor.

Does the college have a well-qualified teaching staff, adequate laboratory equipment, and other advantageous educational facilities?

There are 18 full-time staff members in Western's Industrial Education Department. Each is a specialist in a technical area. All hold advanced degrees with six having completed the doctorate.

Western has the finest physical plant in the Midwest and one of the two or three best in the United States. Included are laboratories for drafting, electricity/electronics, general industrial arts, graphic arts, metal technology, plastics, power mechanics/automotive, and wood technology. Built at a cost of more than $6 million, this air-conditioned building was opened in 1966.

industrial education facilities

Does the school have a reputation for producing teachers who are well trained?

Western produces approximately one-third of all the industrial education teachers in Michigan. Graduates of WMU are in constant demand. One evidence of the quality and reputation of this program is the fact that many of the deans of technical studies and their staff members obtained one or more of their degrees from Western Michigan University.

Does the college have a record of placing its graduates in education?

To date, there has always been a much greater demand for industrial education teachers than there has been supply. Most graduates have opportunities to select from several available jobs. All evidence indicates that this trend will continue for many years due to the increased emphasis on industrial/vocational and technical education in our schools at all levels.

What are the costs for tuition, fees, and other expenses?

The enrollment fees for an undergraduate student from Michigan are relatively modest. The present fee per credit hour for residents of Michigan is $ 18.00 plus additional laboratory fees in most courses. Dormitory room and board costs average $532 per semester.

Is there a guide to the kinds and numbers of courses I may transfer to WMU?

Each year the College of General Studies sends equivalency sheets to all the community/junior colleges in Michigan which show the courses from your college that can be transferred to WMU. For specific information, ask your counselor for this sheet.

The Industrial Education Department also sends equivalency sheets to each of the Michigan community/junior colleges. The equivalency sheets for your college are shown on the following two pages.

It should be noted that any courses listed from departments other than Industrial Education are of equivalent status only within the Industrial Education Department. Non-industrial education majors should consult with their respective departments.

An excessive number of hours transferred from the community/junior college can sometimes be applied toward elective credit.

what are the other opportunities for industrial education graduates?

As long as technology continues to be so important in providing America with a high standard of living, the job opportunities for technically trained personnel will increase. Even though you may not want to enter teaching, there is a great demand for technically trained persons who have completed the bachelor's degree. Many former industrial education teachers serve as training directors, supervisors, and administrators in some of the largest industries in the United States.

WESTERN MICHIGAN UNIVERSITY			SOUTHWESTERN MICHIGAN COLLEGE		
Course		Sem. Hrs.	Course		Sem. Hrs.
Drawing (Industrial Graphics)			**Drafting Technology**		
IED120	Survey of Drafting	3	DRAFT101	Technical Drafting	3
IED226	Industrial Graphics	3	DRAFT102	Technical Drafting	3
IED227	Technical Sketching	3			
ENGT231	Descriptive Geometry	3	DRAFT201	Descriptive Geometry	3
IED326	Advanced Industrial Graphics	3	DRAFT203	Cams and Gears	3
ENGT330	Machine Drafting	3			
ENGT331	Production Drafting	4	DRAFT211	Tool Design	3
IED520	Architectural Graphics	4	ARCH102	Residential Drafting	3
IED522	Laboratory Practices in Drafting	2			
ELECTIVES (5-6 hours)					
IED524	Commercial Architectural Design	2			
IED525	Architectural Perspective and Rendering	2			
ENGT430	Industrial Design	3			
IED150	Graphic Arts	3			
IED350	Photolithographic Techniques	3			
IED276	Industrial Arts Design	2			
IED130	General Metals	3	INTE121	Introduction to Metal Processing	3
IED234	Machine Shop	3	INTE122	Metal Processing	3
IED100	General Woodworking	3			
IED306	Residential Building Construction	4			
Electricity/Electronics			**NO EQUIVALENT AREA**		
IED160	Basic Electricity	3			
ENGT240	Electrical Circuits	3			
ENGT241	Electronic Circuits	3			
ENGT242	Electromagnetic Devices OR	3			
TRAN126	Automotive Carburetion and Electricity	4	AUTO211	Automotive Electrical Systems	3
IED360	Electronic Servicing Techniques	3			
IED460	Laboratory Practices in Electricity/Electronics	3			
ELECTIVES (8-9 hours)					
IED120	Survey of Drafting OR	3	DRAFT101	Technical Drafting	3
IED226	Industrial Graphics	3	DRAFT102	Technical Drafting	3
ENGT340	Electronic Devices	4			
IED560	Electricity/Electronics for Teachers	2			
IED174	General Plastics	3			
IED130	General Metals	3	INTE121	Introduction to Metal Processing	3
IED180	Power Mechanics	3			
IED582	Applied Fluid Power	2			
IED306	Residential Building Construction	4			
General Industrial Arts			**NO EQUIVALENT AREA**		
IED100	General Woodworking OR	3			
IED200	Machine Woodwork	3			
IED120	Survey of Drafting OR	3	DRAFT101	Technical Drafting	3
IED226	Industrial Graphics	3	DRAFT102	Technical Drafting	3
IED130	General Metals	3	INTE121	Introduction to Metal Processing	3
IED150	Graphic Arts	3			
IED160	Basic Electricity	3			
IED170	Industrial Crafts Techniques	3			
IED174	General Plastics	3			
IED180	Power Mechanics	3			
IED276	Industrial Arts Design	2			
IED575	General Industrial Arts Laboratory Organization	2			
ELECTIVES (2-3 hours)					
IED573	Mechanics and Conditioning of Equipment or any advanced course within a technical area but no more than two courses may be elected within any one area.	2			
Graphic Arts and Printing Management			**NO EQUIVALENT COURSES**		

WESTERN MICHIGAN UNIVERSITY			SOUTHWESTERN MICHIGAN COLLEGE		
Course		Sem. Hrs.	Course		Sem. Hrs.
Metal Work			**Industrial Technology**		
IED130	General Metals	3	INTE121	Introduction to Metal Processing	3
IED234	Machine Shop	3	INTE122	Metal Processing	3
IED235	Machine Tool Metalworking	3	INTE201	Production Tooling	3
IED332	Tooling and Production Metalworking	3	INTE221	N.C. and Advanced Machining	3
IED334	Metal Forming and Finishing	3			
IED335	Patternmaking and Foundry	3	INTE131	Welding	2
IED336	Hot Metalworking	3			
IED338	Advanced Metalworking	3			
IED174	General Plastics	2			
IED276	Industrial Arts Design	2			
IED573	Mechanics and Conditioning of Equipment				
ELECTIVES (0 hours)					
Power Mechanics/Automotive			**Automotive Mechanics**		
IED180	Power Mechanics	3			
IED280	Applied Energy and Power	3			
TRAN121	Automotive Chassis	3	AUTO121	Automotive Suspension and Brakes	4
TRAN122	Automatic Transmissions	3	AUTO201	Automotive Driveline	4
TRAN126	Automotive Carburetion and Electricity	4	AUTO211	Automotive Electrical Systems	3
			AUTO111	Fuel Systems	3
TRAN226	Automotive Engines	4	AUTO101	Automotive Engines	3
IED384	Auto Mechanics for Teachers	3			
IED582	Applied Fluid Power	2			
ELECTIVES (5 hours)					
IED160	Basic Electricity	3			
IED560	Electricity/Electronics for Teachers	2			
IED130	General Metals	3	INTE121	Introduction to Metal Processing	3
TRAN222	Fuels and Lubricants	2	AUTO111	Fuel Systems	3
TRAN325	Automotive Testing	4	AUTO221	Automotive Testing	3
IED584	Automotive Technology for Teachers	3			
IED585	Advanced Automotive Technology for Teachers	3			
IED586	Laboratory Practices in Auto Mechanics	3			
IED588	Power Laboratory Techniques	2			
Woodworking			**NO EQUIVALENT COURSES**		

how can i proceed with my transfer to wmu?

Western Michigan University welcomes qualified transfer students from community/junior college programs. Approximately 65 percent of the new students entering the Industrial Education Department of Western each year are transfer students from community/junior colleges.

Transfer students are eligible to participate in all college activities including athletics, to hold offices, and to be considered for financial aid opportunities on the same basis as other upperclassmen at WMU.

Students with a "C" average (2.0) or better in their community/ junior college work should make application prior to the completion of their third semester at the community/junior college.

Applications for admission may be obtained from your community/ junior college counseling office or by contacting:

Director of Admissions
Western Michigan University
Kalamazoo, Michigan 49001

can i be counseled at wmu?

Members of the Admissions Staff and the Industrial Education Department at Western Michigan University stand ready to assist you in any possible way.

Counseling for admission purposes and for credit evaluation is available through the Admissions Office at WMU.

Industrial education counseling may be arranged at any time WMU is in regular session. Official counseling cannot be completed until you have been admitted and a transfer credit evaluation has been made. For counseling contact:

Ind. Arts Tchr. Educ.
Ind. Educ. General Curr.
Ind. Arts Therapy

Undergraduate Counselor
Industrial Education Department
Western Michigan University
Kalamazoo, Michigan 49001
Ph (616) 383-0949

Printing Management

Undergraduate Counselor
Industrial Education Department
Western Michigan University
Kalamazoo, Michigan 49001
Ph (616) 383-1900

Vocational/Tech. Educ.

Undergraduate Counselor
College of Applied Sciences
Western Michigan University
Kalamazoo, Michigan 49001
Ph (616) 383-1940

is it possible for me to secure financial assistance at wmu?

Recognizing that the cost of attending a major university is of concern to many transfer students, Western Michigan University offers a variety of financial aid opportunities.

UNIVERSITY SCHOLARSHIPS – The scholarship program at WMU is designed to reward academic excellence and to alleviate financial need. Students may apply for scholarships ranging from $100 to $1000 a year.

Scholarship application forms and detailed information may be obtained by contacting:

Director of Scholarships
Western Michigan University
Kalamazoo, Michigan 49001

COMMUNITY/JUNIOR COLLEGE SCHOLARSHIPS – Western Michigan University offers a program to transfer students from Michigan community/junior colleges who have successfully completed two years of academic work. For detailed information, write to the:

Scholarship Office
Western Michigan University
Kalamazoo, Michigan 49001

INDUSTRIAL EDUCATION SCHOLARSHIPS – Several scholarships are available only to students enrolled in industrial education. For specific information, contact:

Industrial Education Department
College of Applied Sciences
Western Michigan University
Kalamazoo, Michigan 49001

GRANTS AND LOANS – Several sources of loans and grants are available at WMU including the National Defense Student Loan Program, the Michigan Higher Education Assistance Authority, Federal Student Loan Program, and United Student Aid Funds, Inc.

More detailed information may be obtained from a WMU undergraduate catalog, your community/junior college counselor, or by contacting:

Office of Student Financial Aid
Western Michigan University
Kalamazoo, Michigan 49001

EMPLOYMENT OPPORTUNITIES –
On Campus - Laboratory assistantships are available in the Industrial Education Department where students can work with selected instructors in the various industrial education areas. Application must be made directly to the Industrial Education Department.

The College Work/Study Program, a joint program between the University and the Federal Government, offers part-time employment in the University. Students in the low income group are given priority. A brochure describing this program is available from the Office of Student Financial Aid.

Part-time employment on campus is available in cafeterias, offices, switchboards, as staff assistants in dormitories, as custodians, etc. Direct application should be made to the particular area desired.

Off-Campus - Many part time job opportunities are available to students in and around the city of Kalamazoo. Students interested in part-time, off-campus work opportunities should apply at the Office of Student Financial Aid. They should not do so, however, prior to their approval for classes.

will wmu assist me in securing a teaching position after graduation?

Free career planning and contacts for possible summer jobs are among the services provided by WMU's free Career Planning and Placement Office.

A graduating student is not assured employment, but he does have the chance to meet with possible employers from schools, businesses, and industries.

sprau tower
western michigan university