III Vocational Schools

State of Iowa
DEPARTMENT OF PUBLIC INSTRUCTION
Division of Vocational Education
Des Moines

SUGGESTIONS FOR ORGANIZING VOCATIONAL-TECHNICAL AREA SCHOOLS IN IOWA

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by

B. H. Graeber, Director
Division of Vocational Education

and

O. H. Beaty, State Supervisor
Trade and Industrial Education

F O R E W O R D

This brief leaflet is presented to assist school administrators, principals, supervisors of vocational programs, boards of education, and others in the development of vocational-technical area schools.

While technicians have been employed in manufacturing industries for many years, their importance has become so great as to cause, recently, many studies to be made relative to their use. Some industries use as many as fifteen technicians per engineer. An average estimate for all industries is five per engineer. The Bureau of Labor Statistics has estimated that between 1955-65 a total of 1,350,000 new technicans of various classifications will be needed.

By a recent Congressional Act, funds have been made available to the States on a 50-50 matching basis to develop area vocational-technical schools. The funds may be used to provide technical education below college grade in recognized occupations requiring mathematical and scientific knowledge in fields essential to national defense.

In view of the great shortages of technicians required to help the United States keep its proper place in industrial production among the nations, schools are urged to give consideration to developing technical education on an area basis.

Arthur Carpenter,
Assistant Superintendent of
Public Instruction

Defining the Occupations*

All occupations require some manipulative skills--muscular effort directed effectively to the performance of tasks. All occupations also require some technical skills--mental effort utilized in applying technical knowledge and understanding. Among the occupations concerned with the design, manufacture, sale, installation, and servicing of a wide variety of products are many jobs in which some manipulative skill is required but in which the technical skills are emphasized. Such jobs are found also in the construction field, in the utilities field, in research laboratories, and in other fields. When these occupations lie below the level of the professional engineer and scientist, they are frequently known as vocational-technical occupations. The payroll titles of these jobs are of wide variety.

The term "technician" is commonly used to designate many of these occupations, especially those of a semiprofessional character. For those occupations which are closely affiliated with the work of the engineer, the term "engineering technician" is coming into common use, indicating the higher level technician occupations which ordinarily require the equivalent of two years of full-time study in a curriculum of technical-institute type.

In addition to the technician group, vocational-technical occupations include technical supervisory jobs, technical sales jobs, technical specialist jobs, and others, which sometimes are not classified as within the category of technicians. Vocational-technical occupations also include many jobs which are technical in character but which are of a limited scope and level.

Definition of Technician*

A general term applied to an individual who assists with technical details in a trade or profession. Uses tools, instruments, and/or special devices to design, illustrate, fabricate, maintain, operate, and test objects, materials, or equipment. Performs mathematical and scientific operations reporting on and/or carrying out a prescribed action in relation to them. Examines and evaluates plans, designs, and data; determines action to be taken on the basis of analysis; assists in determining or interpreting work procedures and maintaining harmonious relations among groups of workers.

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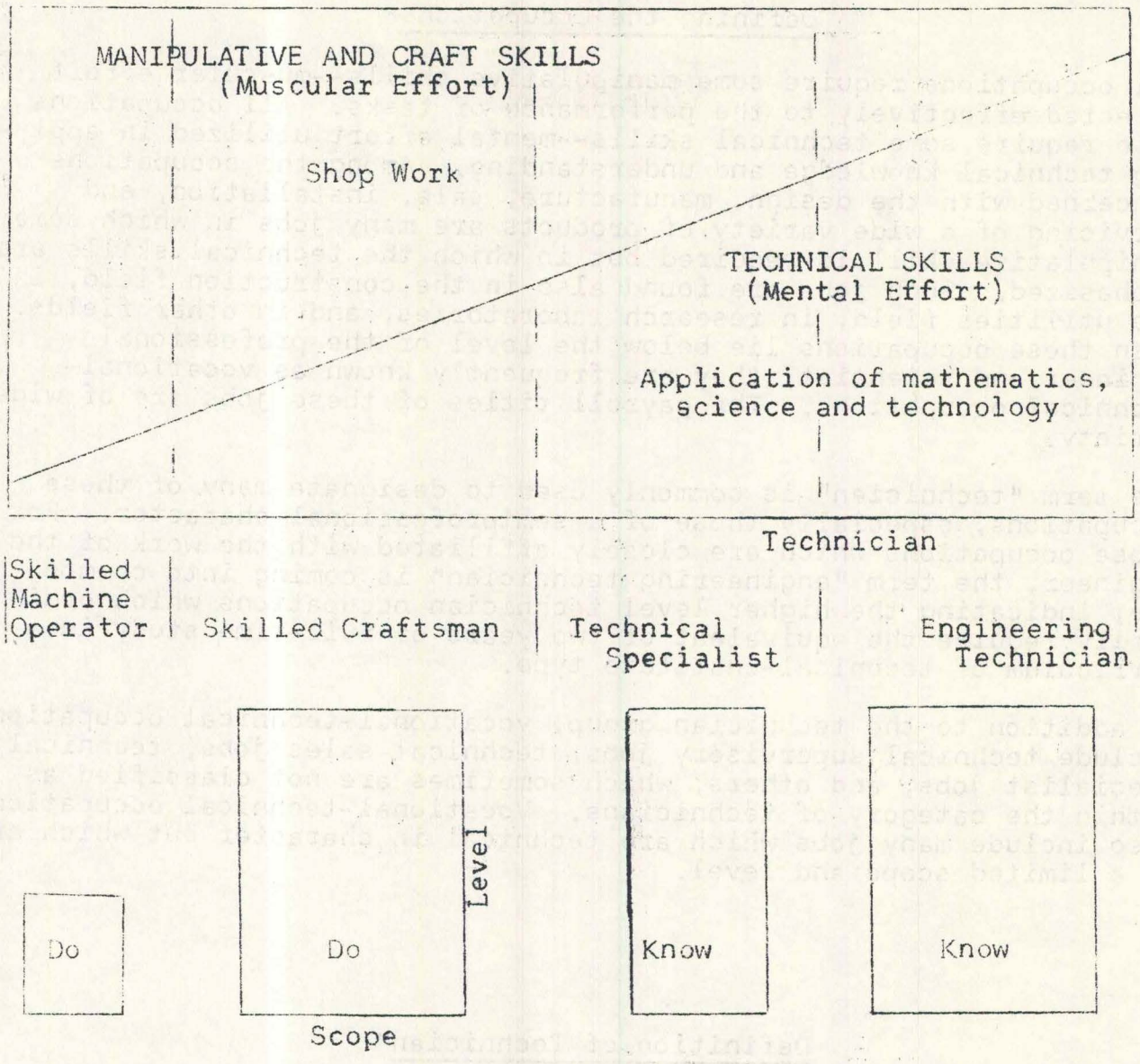
*Selected from Circular No. 530, Vocational-Technical Education for American Industry. U. S. Department of Health, Education, and Welfare, Office of Education

Comparison of Technical Occupations With Skilled Crafts*



Examples of Occupations for Which Training May Be Offered in Area Vocational Technical Schools

Chemical technician	Instrument technician
Electrical "	Mechanical "
Electronic "	Metallurgical "
Industrial "	

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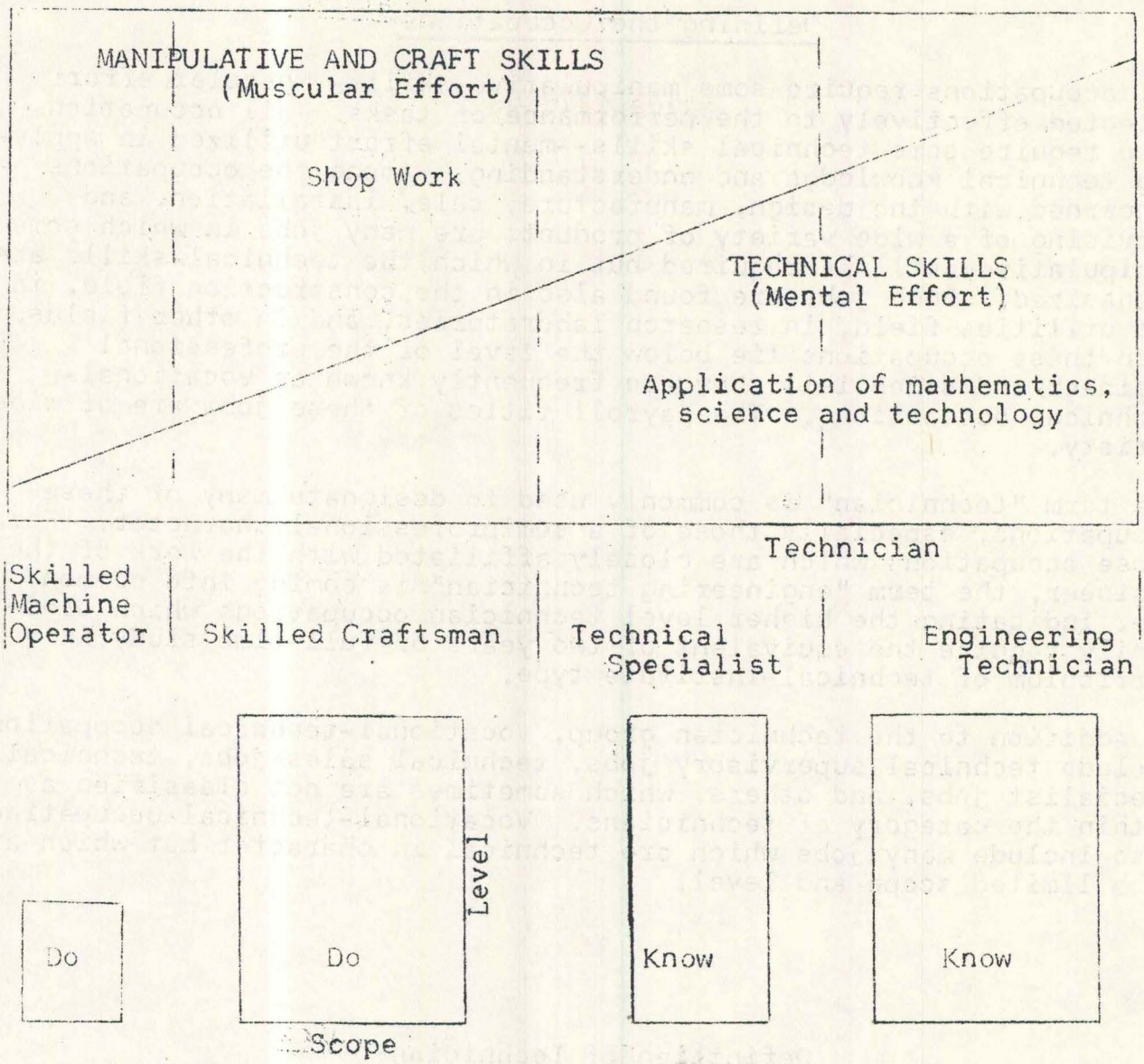

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General Requirements of Area Vocational-Technical Program

1. One or more less-than-college grade courses conducted under public supervision on an organized class basis, classifies as an approvable area vocational-technical program.

2. Courses must be designed to fit individuals for useful employment as highly skilled technicians in recognized occupations requiring scientific and mathematical knowledge in fields necessary for the national defense.

3. The program is made available to residents of an area designated by the State Board.

4. Need for workers must be evident in the employment market in local or larger area as determined through survey.

5. The technical curriculum content is to be based on an analysis of the occupation.

6. Student selection shall be based on interests, aptitudes, previous education and work experience. Enrollees will be selected mainly from post-high school group, but qualified twelfth grade students should not be excluded.

7. Students shall have the necessary general and scientific background or such education made available in addition to technical curriculum without federal assistance.

8. Classes may be conducted during daytime or evening, and for unemployed as well as employed persons, based on student selection as outlined in (6) above.

Use of Funds (50-50 Matching)

1. Salaries and travel of staff and advisory committees, and coordination of work experience.

2. Purchase, rental and maintenance of instructional equipment.

3. Purchase of instructional supplies and teaching aids.

4. Transportation of students when funds for matching purposes are not assessed to students.

5. Studies and surveys relating to need for training, guidance and follow-up.

6. Related instruction for apprentices in recognized technician occupations.

7. Tuition collected from students may be used to pay costs of administration, capital outlay, secretarial service, and other items not reimbursable from federal funds. Funds collected from students may not be used to match federal funds used in the program.

8. To be reimbursable, the science, mathematics, technology and communication skills necessary to satisfactory performance in a technical occupation shall be taught as each applies to the occupational field. These courses, as ordinarily organized, are not reimbursable.

Nature of Instruction

Programs to be approved shall be of less than college grade in that they are designed to lead to employment rather than preparation for further or higher education. The institution's announcement of the program shall indicate this fact.

Educational Institutions In Which Area Vocational Technical Education May Be Offered

Title VIII of the National Defense Act of 1958 provides that area programs are to be conducted under public supervision as direct responsibilities of State Boards of Vocational Education, (State Board of Public Instruction in Iowa). Programs, therefore, may be set up in high schools, junior colleges, colleges, universities, trade schools and technical schools. In establishing programs consideration should be given to locating in institutions in which qualified students will be attracted. Consideration should also be given to geographical location as well as proximity of industrial management and labor personnel. The last will insure assistance needed in the original planning and the operation.

Surveying Needs For Technician Training

1. Surveys to determine the need for training and the supply of qualified trainees are essential requirements for organizing area technical education.

2. In surveying the supply of trainees, the determination of numbers of skilled and semiskilled workers who may be upgraded should always be considered.

3. Before additional surveys are made, thorough use should be made of data from such sources as the U. S. Census; Bureau of Labor Statistics; industrial, trade or products associations; other State surveys; and surveys of similar nature.

4. Appendix B is a sample survey form used in Connecticut. A revised form will no doubt be used for each local situation. Item "2" above should be included on the form developed to determine need for training, since employer and employee groups will be best informed in regard to the possibility of upgrading workers.

Typical Course Outlines

Electrical Technology

C - Class Hours L - Laboratory Hour

FIRST YEAR

First Quarter	C	L
Applied Tech. Math I	5	0
" " Report Writ.	4	0
" Physics I	4	2
Tech. Drawing I	0	6
Electricity I	4	2
Total	17	10

Second Quarter	C	L
Applied Tech. Math II	5	0
" Chemistry I	4	2
" Physics II	4	2
Tech. Drawing II	0	3
Electricity II	4	2
Electric Shop I	0	3
Total	17	12

Third Quarter	C	L
Applied Tech. Math. III	5	0
" Chemistry II	3	2
" Physics III	3	2
Public Speaking (Not reimb.)	3	0
Electric Circuits	3	3
D.C. Machinery	3	3
Total	20	10

SECOND YEAR

First Quarter	C	L
Applied Calculus I	4	0
" Materials for Engin.	4	0
Electric Circuits	3	3
Electronics I	4	3
Electronics Shop I	0	3
D. C. Measurements	2	0
Illumination	3	0
Total	20	9

Second Quarter	C	L
Applied Calculus II	4	0
Economics (Not reimbursable)	4	0
A. C. Machinery	3	3
Electronics II	4	2
Electronics Shop II	0	3
Electrical Layout & Design	0	3
Electronic Circuits and Applications I	3	0
Total	18	11

Sixth Quarter	C	L
Industrial Organization & Management	4	
A. C. Machinery II and Motor Controls	4	3
Electronics III	4	3
Instrumentation & Control Lab.	0	3
Electronic Circuitry & Application II	3	
A. C. Measurements	3	
Applied Math.	2	0
Total	20	

Mechanical Technology

C - Class Hours

L - Laboratory Hours

FIRST YEAR

First Quarter	C	L
Applied Tech. Math. I	5	0
" Physics I	4	2
Tech. Drawing I	0	6
Machine Shop I	0	3
Tech. Report Writ.	4	0
Electricity I	4	2
Total	17	13

Second Quarter	C	L
Applied Tech. Math. II	5	0
" Chemistry I	4	2
" Physics II	4	2
Technical Drawing II	0	3
Machine Shop II	0	3
Electricity II	4	2
Total	17	12

Third Quarter	C	L
Applied Tech. Math. III	5	0
" Mechanics	5	0
Chemistry II	3	2
Public Speaking (Not reimb.)	3	0
Electrical Mach.	3	0
Tech. Drawing III		6
Machine Shop	0	3
Total	19	11

SECOND YEAR

First Quarter	C	L
Applied Calculus I	4	0
Strength of Materials	6	0
Materials of Engin.	5	0
Machine Shop IV	0	3
Manufacturing Processes	5	0
Mechanisms	3	3
Total	23	6

Second Quarter	C	L
Applied Calculus II	4	0
" Fluid Mechanics	4	0
Economics (Not reimb.)	4	0
Machine Design I	5	3
" Shop	0	3
Methods Time Measurement	4	2
Total	21	8

Third Quarter	C	L
Industrial Organization and Management	4	0
Heating and Air Conditioning	6	0
Machine Design II	6	6
" Shop VI	0	3
Manufacturing and Tool Costs	5	0
Total	21	9

(Adapted from Connecticut report)

Appendix A

BIBLIOGRAPHY

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4. Suggestion to States in Promoting, Organizing, Operating and Appraising Programs, Misc. 3561. Department of Health, Education, and Welfare.

5. Vocational-Technical Education for American Industry, Circular 530 (25 p.). Department of Health, Education, and Welfare. For sale by U. S. Government Printing Office, Washington, D. C., 25 cents.

6. Our manpower Future--1955-65. Population Trends, Their Manpower Implications. U. S. Department of Labor, 1954. Superintendent of Documents, U. S. Government Printing Office, 30¢.

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(For more complete bibliography list, see Circular No. 530 listed above.)

Appendix B

Type of Industry_____

How many graduate engineers do you employ?_____

How many technicians do you employ?_____

About what proportion of your graduate engineers' time, if any, is now spent at the technical level?_____

About what proportion of engineers would you employ at the technician level for training purposes or other reasons if there were an adequate supply of both trained engineers and trained technicians from colleges and technical institutes?_____

If there were an adequate supply, how many engineers would you employ in all?_____How many technicians?_____
(Present employment plus job orders actually on file in personnel office)

How do you usually obtain technician level employees? (Percent from each source)

Use engineers_____

Employ trained technicians_____

Upgrade top-notch mechanics and train on job_____

Employ people with some college training and train on job_____

Attract them away from competitors_____

How many technicians would you employ now straight from an accredited two-year post high school technical training program?_____

After that, assuming business conditions remain about the same, how many would you need for replacement or expansion? Check one. One every five years_____Three years_____Two years_____Every year_____ More than one annually_____If more than one annually, how many?_____

What kinds of technician level training would be most useful to your industry? (Do not name areas to interviewee.)

		Percentage of total technician need
Metallurgical	_____	_____
Mechanical	_____	_____
Tool	_____	_____
Electrical	_____	_____
Electronic	_____	_____
Chemical	_____	_____
Industrial Admin.	_____	_____
Computing	_____	_____
Other	_____	_____

How many of your employees need technical level training of a kind that could be given course by course?_____

How many of your employees need the following types of training:

Basic Science -

Applied Mathematics (beyond trigonometry)_____
" Physics_____
" Chemistry _____
Other (Specify)_____
_____
_____

Basic Technology (Do not name areas to interviewee.) -

Mechanical areas, e. g., production control, quality control_____
Tool areas_____
Electrical areas _____
Electronic " _____
Chemical " _____
Other (Specify) _____
_____
_____

If programs were available at some central location which met the needs of your industry, how far would you be willing to send a man:

On company time?_____(miles)
Half on company time, half on own time? _____(miles)

(Adapted from Connecticut survey form)

Appendix C

CHECK LIST FOR DETERMINING WHETHER A TRAINING PROGRAM QUALIFIES AS A HIGHLY SKILLED TECHNICIAN OCCUPATION

1. BASIC QUESTIONS - All responses to the following basic questions should be in the Yes column.

Questions	Yes	No
1. Does the occupation lie between the skilled occupations and the scientific professions in the scope of its content and the level of technical ability required?		
2. Does the occupation require technical competency based upon specialized, intensive training in technical subjects involving the direct application of functional aspects of related sciences and mathematics?		
3. Is the occupation one in which most of the person's work is concerned with the application of technical knowledge and technical understanding in contrast with manipulative skill?		
4. Does the occupation generally require training equivalent to one to two years of full-time study of applied technology in the appropriate field on the post high school level, obtained through		
(a) full-time vocational-technical high school, post-high school, or adult training programs, or		
(b) through extension programs for youth and adults?		

2. SUPPLEMENTARY QUESTIONS: (Since technician occupations vary widely in the specific abilities required, many of the following criteria may not be applicable to all such occupations. A substantial portion of the responses should be in the Yes column.)

Questions	Yes	No
1. Does the occupation require the ability to communicate with others effectively, in oral and written form, verbally and with the use of graphics, in matters pertaining to technical activities?		
2. Does it emphasize analysis and diagnosis of technical problems and situations?		
3. Does it require frequent exercise of ability to make decisions with respect to technical problems?		
4. Does it contend with a large variety of technical situations often involving many factors and variables?		
5. Does it involve the use of a variety of instruments?		
6. Does it involve visualization of plans and drawings, and a degree of creative design?		
7. Does it require ability to supervise the work of other technicians and allied workers?		
8. Does it require an understanding of complicated equipment and processes?		
9. Does it require sales ability in addition to technical understanding and technical skill?		
10. Does it require cost analysis ability in addition to technical understanding and technical skill?		
11. Does it require a working knowledge of the activities of skilled occupations but not necessarily the ability to perform such work?		
12. Does it require mastery of a skilled occupation as a prerequisite to appropriate technical training?		
13. Does it involve knowledge of sources of technical data, and the ability to use handbooks and similar materials effectively?		
14. Does it involve liaison between engineering and production personnel?		
15. Is the work of direct technical assistance to professional personnel engaged in scientific research?		