1953

A Study of the Industrial Arts Safety Conditions in the County and City Public Schools of Yakima, Washington

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A STUDY OF THE INDUSTRIAL ARTS SAFETY CONDITIONS IN THE COUNTY AND CITY PUBLIC SCHOOLS OF YAKIMA, WASHINGTON

by

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A thesis submitted in partial fulfillment of the requirements for the degree of Master of Education, in the Graduate School of the Central Washington College of Education

May, 1953

This paper is submitted in partial fulfillment of the requirements for the degree of Master of Education in the Graduate School of Central Washington College of Education.

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CHAPTER I

INTRODUCTION AND PROBLEM

The people of Yakima county are interested in each other and in their children as is indicated by the number of churches, public buildings and service clubs.

The county of Yakima is situated in Central Washington 149 miles southeast of Seattle, 220 miles southwest of Spokane, 193 miles northeast of Portland and 165 miles southeast of the Grand Coulee Dam. The city of Yakima, with a population of 39,200, is the county seat. Yakima county has a population of 138,200 and is served by two daily papers, three radio stations, fourteen business and professional organizations, eighteen junior and senior high schools, a regional library with twelve community branches and three bookmobiles, fifty-seven churches, ten service clubs, ten reclamation projects irrigating a total of 565,380 acres and with a total 1950 production of over 128 million dollars. Of the 3,072 counties in the United States, Yakima rates:[1]

1st in production of apples, pears and hops
5th in production of cherries

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[1] Yakima Chamber of Commerce, pamphlet, 1951, Central Washington College of Education, Northwest file.

5th in total agricultural production
6th in production of all fruits and nuts
8th in production of peaches
9th in production of plums.

Yakima city alone has eleven grade schools, two junior high schools, one senior high school, one junior college, six parochial schools, two business colleges and one trade school with a public and parochial school enrollment of 11,745. Approximately 70 per cent of the 12,040 homes are privately owned. In 1950 building permits totaling 6,916,155 dollars were issued with 340 permits for new homes. The Yakima valley is not a poor one, neither is it one that has grown so fast that public buildings and services could not keep up with the increased population.

All normal communities devote much time and money toward providing safe conditions for its people. Safety is as large as life itself. Nothing is exempt from it -- the home, the church, the factory or the school. Schools are particularly safety conscious for two reasons. They should provide a safe place for large numbers of children to assemble and they should promote safety learning through formal teaching and through practice. How well, then, does this prosperous and seemingly normal county meet the physical and psychological safety standards in its industrial arts woodshop programs?

I. PURPOSE

The purpose of this thesis is to make a study of the research that has been done in the field of safety in the industrial arts woodshop programs and to compare the recommendations, as they are found, with the actual existing circumstances in the junior and senior high schools of the county of Yakima. For the purpose of this paper the recommendations of authorities are of no value in themselves, neither are the findings of the survey conducted in Yakima county. It is the comparison of the two that constitutes the main objective.

II. PROCEDURE

To accomplish the comparison between maximum and minimum standards as prescribed by authors and authorities in the industrial arts field with those that exist in Yakima county it is (1) desirable to present the history and early foundations of industrial arts and trace its development up to the place it holds in the school curricula of today, and (2) an exhaustive search must be made to find the material that will represent the philosophy and standards of the leaders in this field today. An inclusive survey must be made in the county of Yakima to determine the conditions, both physical and psychological, that exist in the junior and senior high school industrial arts programs. Neither of

these findings are of much importance unless a comparison can be made between the two to ascertain, within limits, how these schools compare with recommendations.

III. LIMITATIONS

The scope of such an undertaking must come within certain limitations. In the county of Yakima woodshops are the most prevalent aspect of the industrial arts program. Therefore, general shops and all unit shops other than woodshops shall be excluded.

Authors and authorities themselves are not in perfect agreement as to positive maximum and minimum standards that should be established, although they do agree within general limits.

The answer to some questions in determining existing conditions are an interpretation, the answer to which must be arrived at by the teacher in charge of the room and the interviewer. An example of such a question is as follows: Is the condition of the work benches good, average or poor? This is a matter of interpretation of what constitutes a good, average or poor work bench.

IV. DEFINITIONS OF TERMS USED

Safety. The state or condition of freedom from danger or risk, exempt from hurt, injury or loss.

Physical safety factors. For the purpose of this paper physical safety factors may be defined as any safety factor as it effects any part of the body except the mind.

Psychological safety factor. Defined as any safety factor as it effects the mind.

CHAPTER II

HISTORY AND EARLY DEVELOPMENT

The industrial arts program as it is known today is the result of the philosophies of many great men and has been influenced by the history and geography of many countries. Rousseau gave us the first basic philosophy of industrial arts. His idea of education was one which least hampers the development of the pupil's native bent.[1] He started the enthusiasm for individual liberty and emotional participation in life. Pestalozzi, who studied Rousseau's writings, believed in communicating all instruction by direct appeal to the senses and understanding of the student.[2] They both believed that the development of the child naturally proceeds from the concrete to the concrete and that the recognition of this fact is essential for the successful teaching of the young.[3]

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[1] Christian Gauss, "Jean Jacques Rousseau, " Encyclopedia Americana, XXIII, 723-25.

[2] Ibid., p. 456.

[3] Ibid., XX, p. 542.

The first adequate analysis of the mechanical arts was established in 1868 by Della Voss, a Russian.[1] The Russian development in mechanical arts was not for general education but for a better method of giving shop instruction as part of the technical training at the college level. Each course of instruction consisted of a graded series of exercises without special reference to their application, and teaching was divided into three successive periods. The first was to learn the names of the tools, their care and their use. The second period was devoted to exercises, making a variety of typical joints used in construction. The third period was spent making parts of machines which may have been real or models.[2] This method of training was considered better both in time spent and material learned than the apprenticeship method.

About this same time the Scandinavian countries were developing sloyd work. This was done by all members of the family during the long winter evenings and consisted of making simple furniture, utensils and tools mostly for their own use. Early sloyd schools were started as a result of a village

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[1] C.A. Bennett, History of Manual and Industrial Education 1870 to 1917 (Peoria, Illinois: The Manual Arts Press, 1937), p. 14.

[2] Ibid., p. 19.

becoming famous for a particular type of work. However, production was foremost in these early schools. The teacher was expected to assist the pupils and often to finish the work if it became to difficult for the student. The downfall of these schools resulted from the introduction of the machine and the increasing manufacture and sale of liquor in that area.[1]

A man who contributed much toward the development of the sloyd school was Cygnaeus, a Finn who was sent to Russian America (Alaska). Here he became aware of the need for popular education. Upon his return to Finland he was appointed the first director of popular education and opened a school in 1866 based upon the Pestalozzian principles.[2] Handiwork was a part of this well-rounded elementary school and all subjects were taught by the same instructor. Cygnaeus was the first man to draw a distinction between the sloyd school and sloyd instruction. Eleven years later Solomon developed educational sloyd as a part of the elementary program in Sweden.

The work of the Swiss philanthropist-educator and disciple of Pestalozzi, Phillip Emanuel von Fellenberg, first established basic principles that substantiated the place of

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[1] Ibid., p. 46.

[2] Ibid., p. 57.

industrial arts as a part of general education. Thus, the idea put forth by Rousseau and Pestalozzi on the educational value of manual work found their application in all countries.[1]

The United States had also developed in its thinking about industrial education. Calvin Milton Woodward, known as the great American champion of manual training in the use of fundamental tools in his applied mechanics classes, was the first to teach shop work without any direct or immediate trade or industrial motive.[2]

The World Exposition of 1876 held in Philadelphia was the first time groups from all parts of the world had displayed their progress in industrial arts. The Russian's display of skills and method of tool instruction, developed in a sequential pattern, created the most interest of the American educators.

John Runkle, president of Massachusetts Institute of Technology, like Woodward, became aware of the benefits of manual training for all and recommended it become a part of general education as opposed to the teaching for a specific trade.

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[1] A. Kahler and E. Hamburger, Education for an Industrial Age (New York: Cornell University Press, 1948), p. 603.

[2] Bennett, op. cit., p. 318.

After this long developmental stage the idea of manual training spread faster. In 1879 the manual training school of Washington University was founded. In 1884 at the annual convention of the National Education Association, a large exhibit of industrial education attracted much attention. In the ten years from 1883 to 1893 manual training was introduced into public schools in more than fifty cities. By 1900 this number was more than doubled.[1]

From the period 1900 to 1950, two major developments have occurred in industrial arts. These were the vocational movement and the general shop method. The vocational movement begun in 1906, recognized the value of industrial arts in general education but also saw the need of a school to prepare the youth for a particular vocation. The major question seemed to be, should the public schools train the apprentices for private business at public expense? This was a highly controversial matter supported by industry with its financial backing and opposed by labor and school men in general.

Several bills were passed promoting governmental support for vocational training in the public schools. The Page bill

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[1] Ibid., p. 397.

in 1911 promoted industrial education. The Smith-Lever bill supporting vocational agriculture was passed in 1914. The Smith-Hughes bill presented in 1914 and made a law in 1917 was the most inclusive bill of them all and exists today. This bill definitely expressed the need for vocational education, where the money should come from, and defined the limits the government should participate. The kinds of schools aided by the Smith-Hughes Act were to be (a) those supported and controlled by the public, (b) less than college grade and (c) designed to prepare boys and girls over fourteen years of age for useful or profitable employment in agriculture and in trades and industries.[1] The Bill as passed included home economics for women.

The Smith-Hughes Act harmonized the three constantly recurring and conflicting interests. These were manufacturers and labor unions, each wishing to regulate vocational training in order to control the labor market, and the conflicting ideals of the supporters of practical education and those who feared vocational training would lower the standards of cultural education. These conflicting ideals still exist. Vocational and industrial arts advocates work together harmoniously for the betterment of education but vocational

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[1] Ibid., p. 547.

supporters still believe in preparation at the high school level for a specific job as opposed to the industrial arts supporters who promote general education.

Wilbur's eight objectives are representative of progressive thinking toward industrial arts in the public schools today.[1] He lists them as follows:

1. To explore industry and American industrial civilization in terms of its organization, raw materials, processes and operations, products and occupations.
2. To develop recreational and avocational activities in the area of constructive work.
3. To increase an appreciation for good craftsmanship and design, both in the products of modern industry and in artifacts from the material cultures of the past.
4. To increase consumer knowledge to a point where students can select, buy, use and maintain the products of industry intelligently.
5. To provide information about, and in so far as possible, experiences in, the basic processes of many industries in order that students may become more competent to choose a future vocation.
6. To encourage creative expression in terms of industrial materials.
7. To develop desirable social relationships, such as cooperation, tolerance, leadership, fellowship and tact.
8. To develop a certain amount of skill in a number of basic individual processes.

It is believed that an industrial arts shop must provide for planning, experimenting, testing and investigating to be part of the general education program today. Tools, machines

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[1] Gordon O. Wilber, Industrial Arts in General Education (Scranton, Penn.: International Textbook Company, 1949), p. 42.

and materials cannot be used without attaining some skill although teaching of skills is not as important in industrial arts as in vocational education.

There are two schools of thought as to the best way to approach these goals and objectives. Each method will be presented, but it is not the purpose of this paper to discuss the merits of either. The unit shop, which is the most prevalent, teaches one subject area in a given room under one teacher. For example, a shop that has one teacher and the only subject area taught is sheet metal, then this is a unit shop in sheet metal. Most small schools under the unit method only have one shop which is wood. Larger schools may have several unit shops in one building, each being separate from the other, covering different areas and of course under different teachers. Unit shops naturally stress the area involved and do not give the student a picture or an opportunity to explore in other areas. This type of shop, then, does not meet the objectives of industrial arts unless there are sufficient unit shops available to the student to enable him to take courses in each of the shops, experiment, explore and attain a few skills in several of the units within a relatively few years. This is impossible in small schools.

To overcome this situation in the smaller schools, and even on occasion in large schools, the general shop method is employed. A general shop may be defined as an

industrial arts class under one teacher engaged in two or more areas of work at one time. The advantages of a general shop are as follows:[1]

1. It is well adapted to the organization of industrial arts content in the light of the general education, exploration and guidance aims of the junior high school.
2. It permits students to be treated as individuals with due respect for their differences in interests and capacity.
3. It enables a student to discover his abilities and aptitudes through manipulation of a wide range of materials, tools, and the processes that go with them.
4. It offers an economical way to gain experience in many activities.
5. It makes possible an adequate industrial arts program in a small school.
6. It stimulates the setting up of a well planned shop and a carefully organized teaching content.
7. It increases teacher efficiency.

The unit general shop rotates the entire group through different subject areas in the same shop at different times under one teacher. A comparison of the general shop, the unit shop and the unit general shop is shown graphically on page fifteen.[2] Critics of the general shop state that not enough is done in any one area to be of value. However, the greatest criticism is that a teacher can not spread himself

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[1] L.V. NewKirk, Organizing and Teaching the General Shop (Peoria, Illinois: The Manual Arts Press, 1947), p. 18.

[2] Ibid., p. 17.

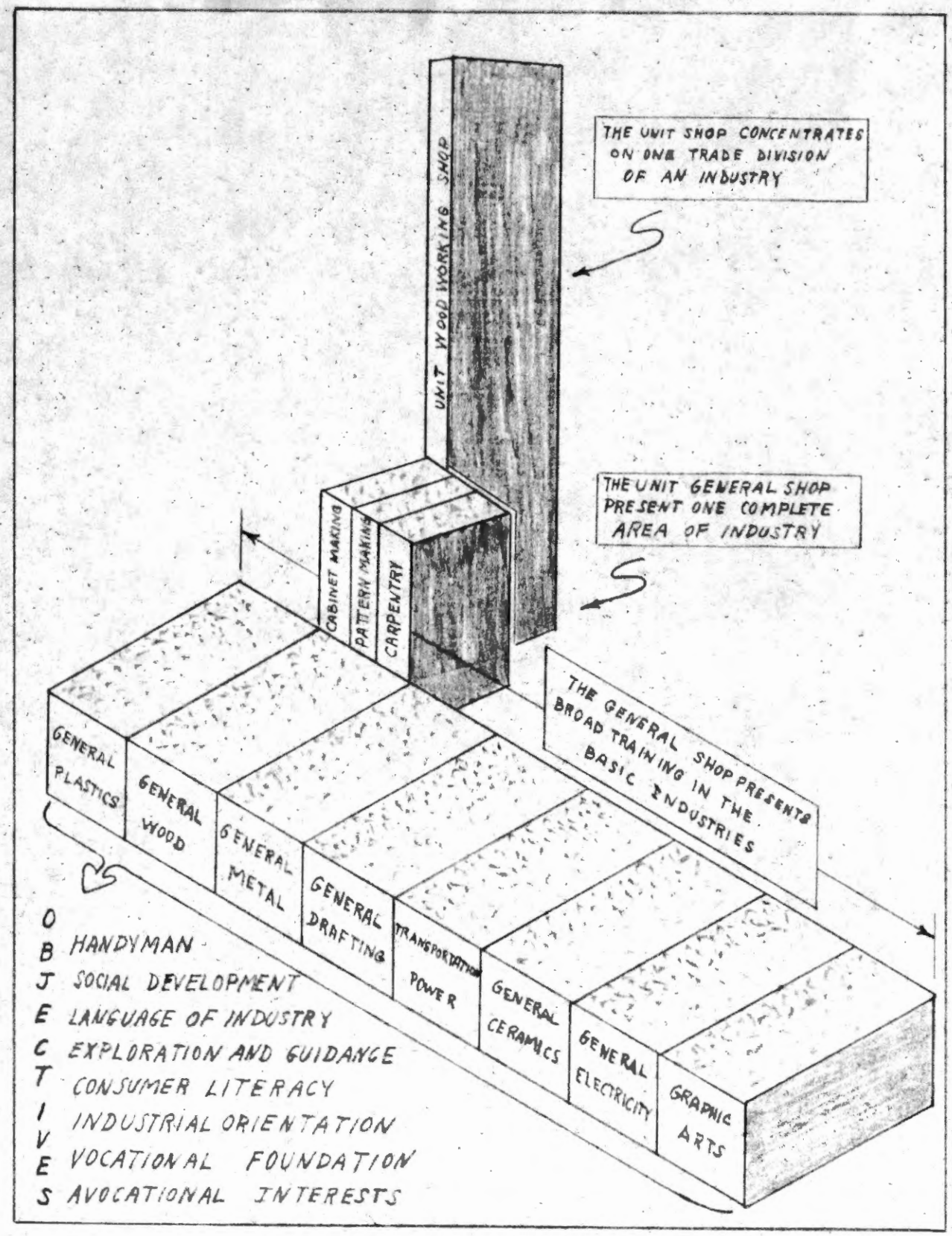

FIGURE 1

RELATIONSHIP OF GENERAL SHOP, UNIT GENERAL SHOP, AND UNIT SHOP

thin enough to adequately teach several small groups in separate areas, using different media, at the same time. Critics also believe this situation promotes disciplinary problems.

The history of industrial arts had its early founding with that of general education. In the beginnings industrial education was greatly influenced by the environment surrounding the program as well as the philosophy of its instructors. As time passed a split developed; on one hand was vocational education, stressing preparation for a specific job and on the other hand was industrial arts, early known as manual training, stressing general education. These two theories of thought still exist but work together hormoniously. The general shop and unit shop are not opposed to each other but stress different objectives. The general shop offers two or more work areas at the same time as contrasting to the unit shop which offers one area.

All shops, whether vocational or industrial arts, unit or general, have one common problem of safety. Regardless of educational objectives, all shops must include safety as a part of every lesson, demonstration or other learning technique. The definition of safety doesn't give any limitations. It doesn't discriminate between physical and mental danger or risks. Therefore a 200 watt clear light bulb on the eye level may be less safe than a jointer without a belt guard. A dirty sink may be dangerous. It is the purpose of

this paper to cover many of the factors that directly and indirectly, physically and psychologically, effect the safety of the students in the industrial arts programs and to compare the recommendations of authors and authorities with conditions that actually exist.

CHAPTER III

RECOMMENDED STANDARDS AND PHYSICAL FACTORS

It might justly be said that the best guard for any machine is between the ears of the operator. Lectures, demonstrations or safety oaths have relatively little effect upon the operator unless he has the right attitude toward safety in his shop work and especially around machines. To preach constantly about rules in a shop is poor practice. To make no attempt at a cooperative attitude is still worse.[1] Therefore, it is the students attitude toward the shop and suitable conduct that is of primary importance.

A wild elephant charging through the jungle at you might change his mind the last minute and avoid trampling you. An enraged bull coming at you full speed, might, the last instant, change his mind and pass you, but a machine has no mind or human leniency. If the student's finger is pressed against the table saw when it is revolving, the machine will cut it off, not once in awhile, but every time. There are several conditions affecting class reactions

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[1] E.E. Ericson, Teaching Problems in Industrial Arts, (Peoria, Illinois: The Manual Arts Press, 1930), p. 47.

toward safety. A few may be listed as follows:[1]

1. Is there an assigned working place for each student?
2. Is there sufficient space between benches or working places?
3. Is there adequate and proper light?
4. Are machines and common equipment centrally located?
5. Is there a special room for class teaching?
6. Are there adequate locker facilities?
7. What is the condition of the equipment?
8. Is there order in the tool room?
9. Is there ample ventilation?
10. Is cleanliness practiced?
11. Is there shop atmosphere?

The boy must be made to realize that his primary purpost in the class is to learn, not to make a project to take home. If he is going to learn he must start with the basic processes and become proficient in certain skills. Also, he must learn to be careful, not to take chances and to be cognizant of others. At the beginning of the class the teacher renews his efforts and the student is interested and excited in this new laboratory class. As the teacher falls into a routine and the student has become accustomed to his work both tend to become lax. Ericson lists four reasons that enthusiasm lapses.[2]

1. First wave of interest subsides when the newness of work wears off.
2. As the interest becomes intense in production work, carelessness may show itself.

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[1] Ibid., p. 105.

[2] Ibid., p. 116.

3. Some students who start bravely lose interest due to inability or lack of natural aptitude.
4. The instructor begins to weaken little by little and his enthusiasm and fairness gives way to tolerance and follows the path of least resistance.

Attitude plays an important part in the development of the student in his shop program. One of the greatest influences to develop this attitude is through the frame of mind of the teacher. Boys find it difficult to have a lack-a-daisical interest when the instructor is sincere, honest and enthused about his work.

Attitude, quality of work and safety are related to the length of the period. Too short a class period promotes hasty work and a feeling that he doesn't want to start something very large as he will have to stop in the middle of a process and put his work away. It is important to the child that he sees progress in his work. This would be difficult during a short period, since most shops do their own clean up and work time available in one period is considerably less than the time between bells. Too long a period is conducive to both physical and mental fatigue. If the periods are double or over one hour long some means of rest or change from the routine should be incorporated.

In order to promote good workmanship, enthusiasm and general attitude, constant or periodical display of the work

done in the industrial arts departments are desirable.[1] Bulletin boards promote interest if they are changed periodically and reasonable effort is made toward them. Some instructors have been successful in appointing committees to assume the responsibility of maintaining the bulletin board. What does all this have to do with safety? It promotes pride in one's work. It gives a boy public recognition which he may never have had before. It stimulates him to do better, not only in craftsmanship but in responsibility, cooperation and sincerity to his class and his school.

To further promote the desirable qualities in the student as well as another means to present material in an interesting way is through audio visual aids, which may be defined as any type of audio or visual stimulus used to supplement instruction by the spoken or printed word. Wilber[2] states that the contributions of audio visual aids are as follows:

1. Aid to exploration and orientation
2. Related information
3. Teaching skills
4. Atmosphere

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[1] R.R. Harmon, Chairman, "National Council on School house Construction," Plant Guide Commission, 1949, p. 68.

[2] Wilber, op. cit., p. 125.

Often when a person speaks of audio visual aids only the motion picture comes into mind. There are many other types of audio visual aids which may be used beneficially. Wilber[1] presents the following:

1. Industrial trips
2. Demonstrations
3. Moving pictures
   a. It is especially valuable in bringing to the classroom certain aspects of industry which cannot readily be seen at first hand.
   b. There is perhaps no other medium that can impress upon the young learner the necessity for working safely as the motion picture.
4. Mock ups
5. Charts, pictures, graphs, maps, etc.
6. Film strips
7. Slides
8. Reflectroscopes
9. Project charts

Many times the class gets the idea that these aids are for their amusement and unless the instructor makes some preparation for an organized method of study, the resultant will be mostly entertainment. Many of these techniques lend themselves nicely for the incorporation of safety learning. As has been pointed out, safety is not a separate subject and normally should not be taken up as instruction isolated from the particular activity involved. In the presentation of all the instructional aids listed above there should be safety instructions. This may be presented openly and point-

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[1] Ibid., p. 133.

edly as a safe method, or the idea may be cleverly disguised to the extent the student is not aware of receiving safety instruction as part of the whole process.

Any one method of presentation of new material is not necessarily the best, but merely another way of appealing to the various senses. Each individual is different as to which sensory department presents the best image to him. The sense department that presents the best image to a particular person in one situation may not be the same sense that presents the best image at another time and circumstance.[1] It behooves anyone to know which sensory department is going to present the best image to a particular individual at a given time. The solution then, is to appeal to as many senses as the instructor can cleverly incorporate into the learning situation.

The forgetting rate of any new learning is relatively high, depending upon many variables. Ebbinghans states that the ratio of what is retained to what is forgotten varies inversely with the logarithm of time and has a formula to that effect.[2] Whether or not this formula is understood completely or not, it is evident that retention is short, and implies to the teacher that safety instruction must not only

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[1] J.B. Stroud, Psychology in Education (New York: Longmans, Green and Company, 1946), p. 443.

[2] Ibid., p. 505.

appeal to the various senses but also must be repeated many times before the student has built up an aggregate of safety knowledge that will benefit him as he meets life situations.

Safety is not just for young boys in school shops. United States Steel spends $20,000,000 yearly on safety.[1] It is a real problem and everyone should do his part in keeping accident rates down. To promote awareness and to foster learning, field trips to industrial plants serve a good purpose. Usually such a trip is made to a factory that is of a type closely related to the subject, such as a sawmill, a furniture factory or some other community resource. The instructor should remember, however, that the full instructional value of such trips will not be realized unless they are carefully planned.[2] These trips may be made by the entire class or by an individual. Whichever is used, a follow up and review of instructional and safety procedures noted should be discussed. Even without the class taking a trip most of them will be aware of some of the attention paid to safety by industrial firms. A class project could be organ-

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[1] Safety Education, pamphlet, March 1951, p. 7.

[2] Newkirk, op. cit., p. 137.

ized around everyone observing how many different methods private companies paid attention to safety, such as: the posting of the number of days since the last accident, posters stressing safety, special guards used, safety wearing apparel and the employment of men whose sole purpose is safety in all its forms, called the safety engineer.

Guest speakers may be employed to promote safety. There are several steps or precautions to bear in mind when asking someone to speak before a class. First, does he really have anything to talk about that is pertinent and interesting? Second, does he have his presentation well organized? Third, does he hold a recognized position of importance? Fourth, does he talk on the interpretation level of the students? Again speakers are not the only way, but merely another way to present instruction.

The development of attitude and philosophy goes farther than mere instruction. Certain facilities must be provided for the comfort and well being of the entire group. Toilets should be close to the shops and come within certain limitations. Each general toilet area should provide one water closed per ninety boys and one urinal per thirty boys.[1]

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[1] P.S. Waldeck, A Guide for Industrial Arts Shop Planning, Ohio State Department of Education, 1949, p. 10.

Washing facilities should be provided in each shop to allow one wash position for every ten students.[1] Drinking fountains should be provided one for every twenty-five pupils with at least one in every shop.[2] These facilities should be well maintained and kept clean, either by the students or a janitor. An individual is said to be frustrated when he is balked in his drive toward a goal.[3] If a teacher works hard and establishes within a boy a goal which is skill, attitude, reliability, cleanliness and others, and then the student comes in contact with a situation which blocks the path toward full attainment of these objectives, such as a sink used to wash out paint brushes, dirty urinals or an untidy shop in general, frustration is caused and aggression is promoted resulting in undesirable behavior. As Stroud[4] states ... The occurrence of aggressive behavior always presupposes the existence of frustration and contrariwise, that the existence of frustration always leads to some form of aggression.

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[1] R.R. Harmon, op. cit., p. 68.

[2] C.E. Turner, School Health and Health Education (St. Louis: C.V. Mosly Company, 1947), p. 191.

[3] Stroud, op. cit., p. 248.

[4] Ibid., p. 248.

Sufficient lockers and project storage space is of significance in two ways, physically with respect to the project and psychologically with respect to the student. Physically, a student needs a locker to put his personal belongings in when he enters the room. He also needs a place to keep unassembled projects from being stolen or damaged during his absence. It is difficult to eliminate damage to projects and the loss of parts if all the students have access to everyone elses work. Psychologically, it is depressing and enraging for a boy to come to class all excited about getting to work on his project that is progressing so well and find a big dent in the top, or a leg broken, or some similar situation. What frame of mind is this boy going to be in for the next few shop periods and what has happened to the attitude toward others and toward safety that the teacher has constantly worked toward developing? The answer is obvious.

The size and number of lockers desirable varies with each school, the level of the students being taught and the size of the projects being made. Lockers may be located along one side or more of the room or may be in a concentrated area. In the lower grades where projects are necessarily smaller, lockers built into each bench works well and is very conservative of space. Lockers may be arranged under the wall benches or out in the corridor, where they take up room which would otherwise be used only for supplies or not

used at all.[1]

Material storage is also dependent upon the course of study. Schools not requiring much storage area may provide lumber racks in one corner of the room. Schools building larger projects may find it necessary to have a separate lumber room. Whatever method of storage is used the lumber should be stacked to prevent warping and twisting. It is wasteful to allow lumber to become warped or twisted and it is discouraging to the student trying to use it. As part of the whole industrial arts program, the lumber room must be kept neat, the various woods separated and the entire area maintained in line with the same general objectives.

The floor area depends somewhat on the type of shop, whether a unit wood or a general shop. The general shop should be somewhat larger to make a more definite break between the various areas. Most authors and authorities agree that the minimum floor area per student should be fifty square feet exclusive of auxiliary space and seventy square feet per pupil including auxiliary space.[2]

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[1] Newkirk, op. cit., p. 85.

[2] Waldeck, op. cit., p. 10.

Four states make recommendations as follows:[1]

New York - A base gross area of seventy-five square feet per pupil with a minimum of 1500 square feet for a class of twenty-five under one teacher.
Michigan - Minimum of fifty sqyare feet new per pupil excluding storage, tool crib, finishing room, planning room etc.
Virginia - Gross interior of 120 square feet per pupil.
Louisiana - Ninety-two square feet per pupil and a class average of from sixteen to twenty.

Newkirk[2] states that ninety square feet per pupil is desirable. The National Council on Schoolhouse Construction[3] advocated fifty to seventy-five square feet per pupil with 1500 square feet as a minimum. Waldeck[4] reports that the shape of the industrial arts room is important and that the ratio of length to width should be two to one or one and one-half to one. Irregular shaped laboratories such as V or L shape are undesirable because of the lack of visibility and ease of supervision. The class level and course of study also determines the desired floor area. In the lower grades where the projects are smaller it would not be necessary to have as much space as in a senior highschool where large

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[1] Douglass Haskell,"Planning the General Shop," School Shop, June, 1946.

[2] L.V. Newkirk and W.H. Johnson, The Industrial Arts Program (New York: The MacMillan Company, 1948), p. 203.

[3] Harmon, op. cit., p. 68.

[4] Waldeck, op. cit., p. 11.

projects and machinery were common. However, the floor area should be large enough for the course of study and it should not be necessary to temper the course to fit the floor area.

The construction of the floor may vary according to the program offered but should come up to certain limitations. The following factors should be taken into account in the selection of the most satisfactory floor for each room area:[1]

1. The initial cost
2. Expense in cleaning and maintaining
3. The degree of ability to withstand abuse
4. Resilience should location demand
5. Acoustical and noise deadening values
6. Sanitary qualities
7. Fire retarding qualities
8. Non slip qualities
9. Resistance to defacement
10. Suitability for damp and wet locations
11. Appearance
12. Fire resistant
13. Degrees of slipperiness

Cannon's study of the choice of materials for shop floors by superintendents as compared to the choice of architects resulted in the following comparison:[2]

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[1] M.A. Stonemans, et al., Planning and Modernizing the School Plant (Lincoln, Nebraska: University of Nebraska Press, 1949), p. 123.

[2] J.W. Cannon, "Materials Preferred by Architects and Schoolmen for Room Backgrounds," Nations Schools, 34:37, Sept. 1944.

Material	Superintendents choice	Architects choice
cement	39	26
wood block	22	36
wood maple	20	16

The amount of floor area is also dependent upon the number of work stations desirable. There should be at least fifty per cent more work stations provided than the maximum number of pupils using the laboratory at one time.[1] A work station may be defined as any location in the laboratory where a pupil may be engaged such as a bench, vise, tool room, wash basin, reading table, etc.[2] Using the recommended percentage for a class of twenty-five there should be a minimum of thirty-seven and one-half work stations.

There are many types of work benches, some of which are conservative of space. The metal base four man type with twelve built in lockers is economical of both space and money. A four man metal base bench of standard size, 54" X 64", with twelve lockers, 36" X 21" X 30", costs $245. A two man wooden bench of standard size, 52" X 36", costs $209. To set up for a class of twenty-four the metal base type would cost six times $245 or $1470. To equip the same class with the all wood bench would cost twelve times $209.85 or $2518.20. The metal base then would be a savings of $1048.[3]

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[1] Waldeck, op. cit., p. 10.

[2] Ibid., p. 11.

[3] Brodhead-Garrett Co., Catalogue, Cleveland, Ohio: 1951, p. 52.

The space saved by the use of the metal base bench is about five per cent. (See Figures two and three.). The metal base four man bench is not becoming popular as the figures would seem to justify. Many teachers were trained using a two man bench and do not wish to change. Many believe that the four students being close together on inside corners would present disciplinary problems. In new buildings or remodeling, a consideration of the four man bench warrants investigation.

Woodworking vises are of two general types, the continious screw and the rapid acting. The continuous screw type is slower but will last longer. It does require considerable patience to open or close such a model when in a hurry. The rapid acting type of comparable size costs about $1.50 more and does require the replacement of one particular part after long use. This rapid acting type releases on a one-half turn counter clockwise, allowing the moveable jaw to be pushed close. A one-half turn clockwise will tighten the moveable jaw against the work.

A good vise is essential for two reasons. A poor vise is apt not to hold the wood tightly, resulting in damage to the wood. A good vise promotes a better psychological attitude toward the vise itself and consequently toward the project as the vise holds each piece firmly and adjusts quickly, allowing the student to work at his capacity.

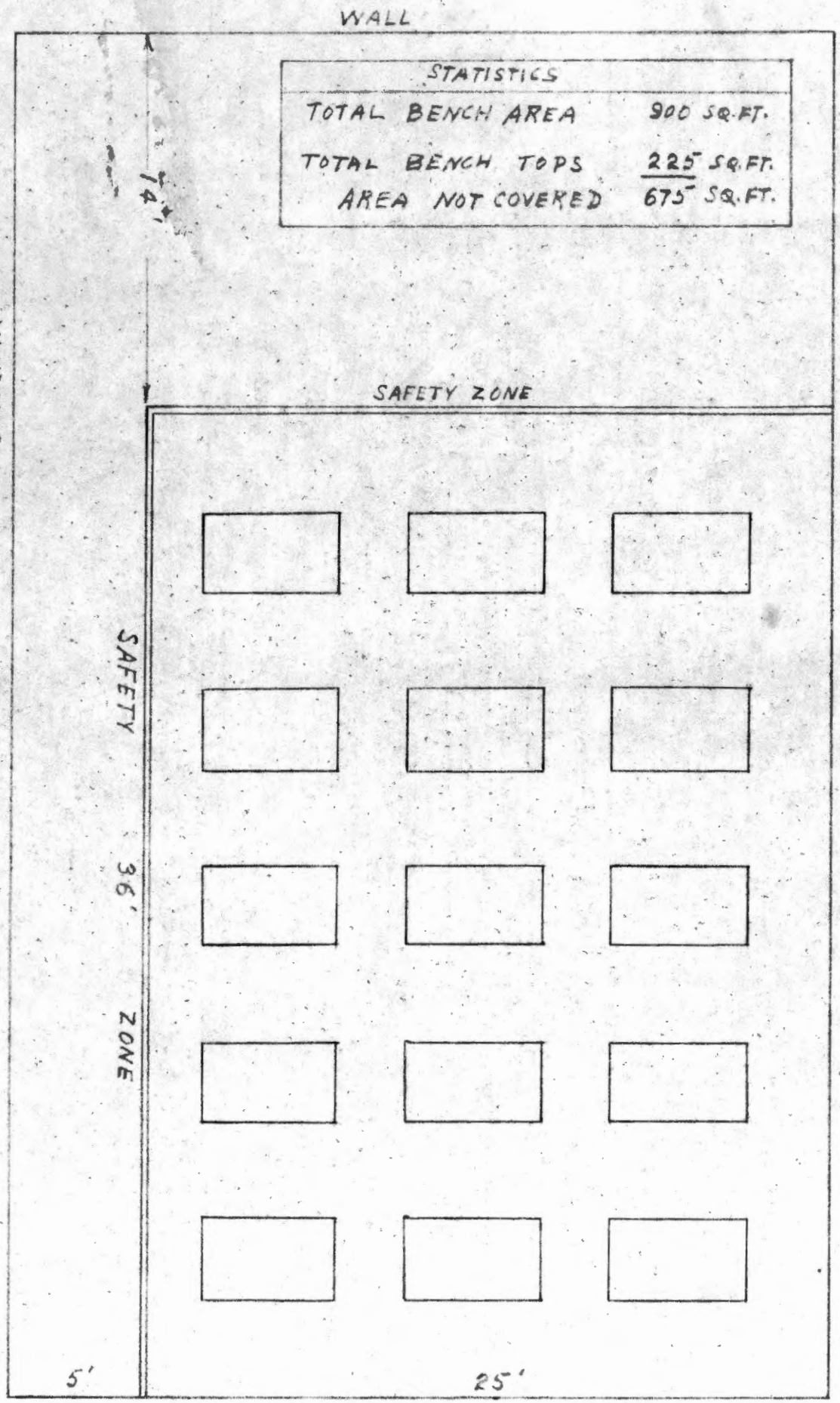

FIGURE 2
A SHOP WITH FIFTEEN TWO-MAN BENCHES

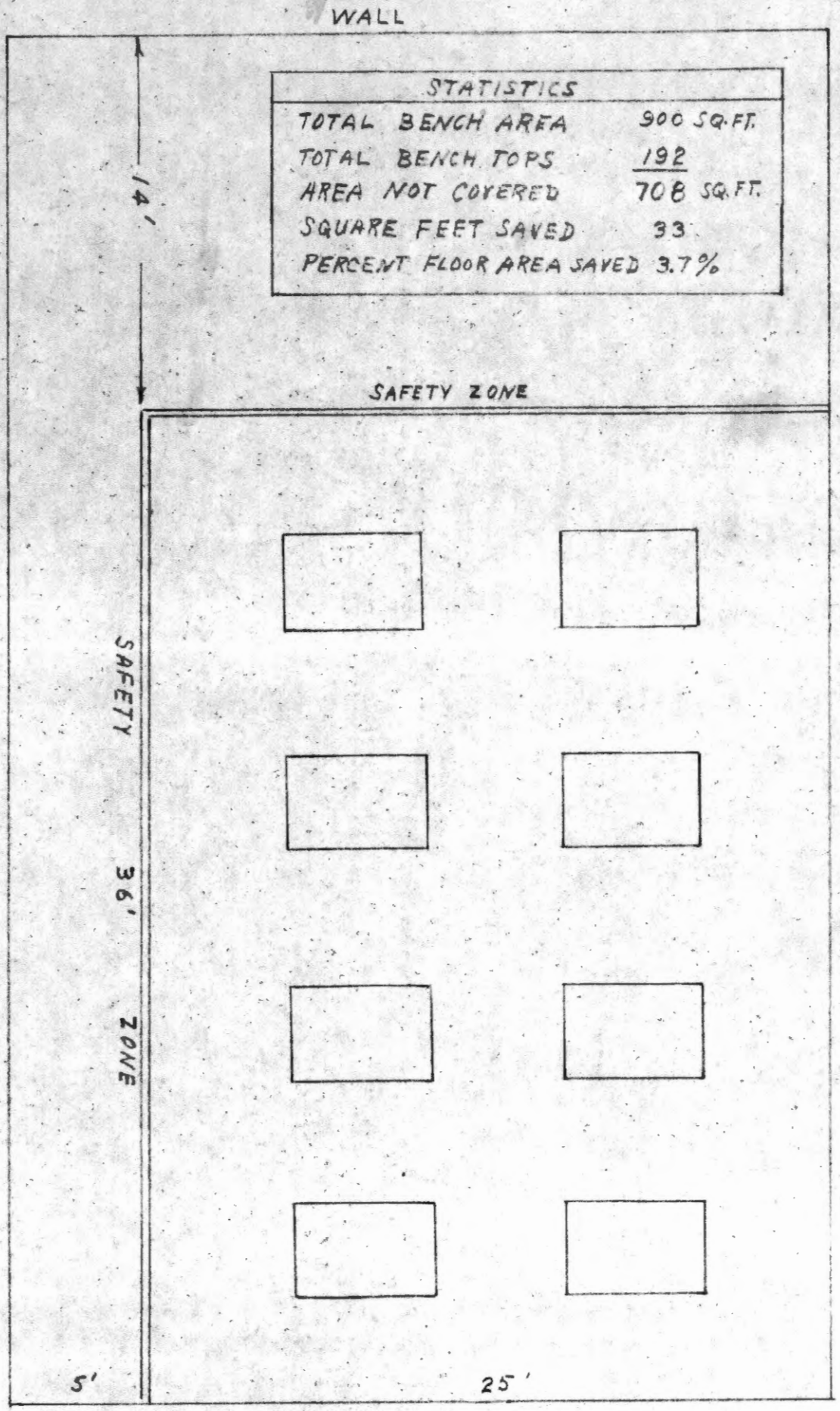

FIGURE 3
SAME SHOP WITH EIGHT FOUR-MAN BENCHES

The number and kind of power tools that should be provided in a woodshop is not a set number. Each individual teacher has a different opinion which is based upon the course of study he presents and the grade level. Many teachers advocate that a junior high school has no business using a power saw, jointer or sander. They believe a junior high boy is not capable of using these machines or he should learn hand operations first. Others believe this is a machine age and all boys should learn to use machines as part of their general education for the world today.

One of the greatest deciding factors should be whether or not the use of machines can be taught and employed without greatly increasing the danger of accidents. Many home workshops have a good quantity of power tools. If it is the purpose of industrial arts to offer experience and develop a certain amount of skills, preparatory to meeting life's situations, then an introduction to machines, their uses, care and upkeep, and above all their safe operation is very important. Just when this program should be started and to what extent it is to be covered is controversial.

The number of hand tools that should be provided in a woodshop is determined again by the philosophy of the teacher. All students should receive proper instruction on the use, maintainance and safe usage of the basic hand tools

and of any special ones that he may encounter during the development of his projects.

It is important that the student knows the right tool for the right job and that he develops a philosophy toward hand tools. Shops where hand tools are treated with disrespect, are not kept sharp or in condition, are forced beyond normal endurance and are not stored in an orderly fashion, is a dangerous one.

The fact that dull tools are dangerous stands by itself. Boys are apt to try to use dull tools and then become careless when they do not perform properly. This may result in a direct accident or the student may lose his interest and be under the apprehension he has no aptitude or particular liking for woodwork. An uninterested boy with a defeatist attitude is earmarked for trouble and accidents.

Painting and finishing are part of a woodshop program and should be separated from the main laboratory. Glass partitions are nice as they allow the teacher to control the room even though not in it. Illumination and ventilation are important. Fumes from modern finishes are poisonous and detrimental to the health of anyone breathing them over a period of time. If a spray gun is used forced ventilation is required by law and safety precautions are paramount.[1]

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[1] Newkirk and Johnson, op. cit., p. 203.

Illumination is important to do a good job. Spots are apt to be missed either in hand painting or spray painting if light is not adequate. Missed spots, stain streaks and other mishaps are not aids to better attitudes and philosophy of the student. Fireproof facilities should be provided for all paints, varnishes, stains and thinners. These are very volatile and inflammable. A spark caused by an electric motor or for any reason may cause fire or an explosion. Fumes caused by the use of spray guns are particularly dangerous in this regard.

The importance of air conditions is by no means restricted to the finishing room. The American Association of Secondary Administrators twenty-seventh year book states:[1]

> When odors, obnoxious fumes or dust arise from localized sources, they should be removed by special vents at their sources and through ducts entirely segregated from the ventilating system serving the rest of the school.

Odell[2] states that it is particularly important in all woodshops that there be automatic suction dust collectors.

One of the greatest arguments against such exhausts is that the students are not in this substandard environment

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[1] American Association of Secondary Administrators, "American School Buildings," Twenty-seventh Yearbook of the National Education Association, Washington D.C., 1949.

[2] C.W. Odell, Standards for the Evaluation of Secondary School Buildings, Bulletin, University of Illinois, 1950, p.36.

long enough in one day to warrant the necessary expenditure. Little or no regard is given the teacher who must be in the room all day. Philosophy, attitude and pride in one's work is difficult to measure but is of great importance. Dust settling over the entire room, on all the machines and equipment, on all the projects, ledges, window sills and even on the students themselves is not conducive to a healthy development and attainment of some of the major objectives of industrial arts.

Stoneman[1] states that local exhausts should be used to carry off all wood dust, chips and abrasives. Holly[2] supports this and said that automatic suction dust collectors should be provided on all machines where dust of any kind results from operation. Most machines today have attachments or facilities for the disposal of dust, or a central exhaust system with ducts to the necessary machines may be used. In some of the more efficient systems the dust is removed and the good air recirculated.

Aside from fumes and dust, the woodshop should come up to the standards as established for all classrooms. In general a room which provides 470 cubic feet of air space per person should be provided with seven cubic feet of fresh

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[1] Stoneman, op. cit., p. 314.

[2] T.C. Holly and W.E. Arnold, Standards for the Evaluation of School Buildings (Columbus: The Ohio State University, 1936), p. 26.

air per person per minute. A room which provides 200 cubic feet per person should provide sixteen cubic feet of fresh air per person per minute and a room that provides 100 cubic feet of air per person should provide twenty-five cubic feet of fresh air per person per minute. The amount of fresh air required is not as much as it used to be and circulation has increased in importance.

A desirable standard for shop sound is a maximum of eight decibels. Excessive noise interferes with articulation, hearing and pupil thinking.[1] This would result in increasing the possibility of an accident. Danger may often be anticipated by the sound a machine or tool is making if it can be heard. An example would be the slowing down of a band saw in cutting too sharp a curve.

Acoustical treatment of walls, ceilings and machinery all assist in cutting down on the total noise in the room. Ceiling absorption should not be less than 50 per cent and should not be less than twelve feet high.[2] One hundred per cent absorption may be compared to an open window where there

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[1] A.B. Mays, "Industrial Education", The Enclyclopedia of Educational Research, Walter S. Monroe, Editor (New York: The MacMillan Company, 1950), p. 583.

[2] Waldeck, op. cit., p.12.

is no rebounding of the sound waves back into the room. Figure four shows graphically the desirable range of reverberation time.

Few of us can do anything about existing conditions of natural light, windows are not easily changed or rooms rearranged, but each and every teacher can take inventory of the artificial lighting conditions and inaugurate steps to bring them up to present standards.[1] A great deal of research has been carried on in the field of lighting. Although various authors recommend different standards, they all come within certain limits. Before presenting further material, selected technical terms are defined as follows:[2]

> Candle power - The luminous intensity of a light source in any one given direction measured in terms of the number of standard candles it would take to reproduce that intensity.
>
> Foot candle - A unit of measurement of intensity on an object equal to the amount of light falling on any one given point of perpendicular sufface, one foot from a standard candle.
>
> Lumen - A unit of measurement of quality of light equal to the amount of light from a standard candle falling on an area of one square foot, one foot from the source or with an intensity of one foot candle.
>
> Brightness - The amount of light emitted, or reflected, from a surface measured in terms of candle power per square inch.

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[1] E.W. Bollinger, "Securing the Right Kind of Light," The Industrial Arts and Vocational Education Magazine, 22:136, 1933.

[2] Ibid., p.137.

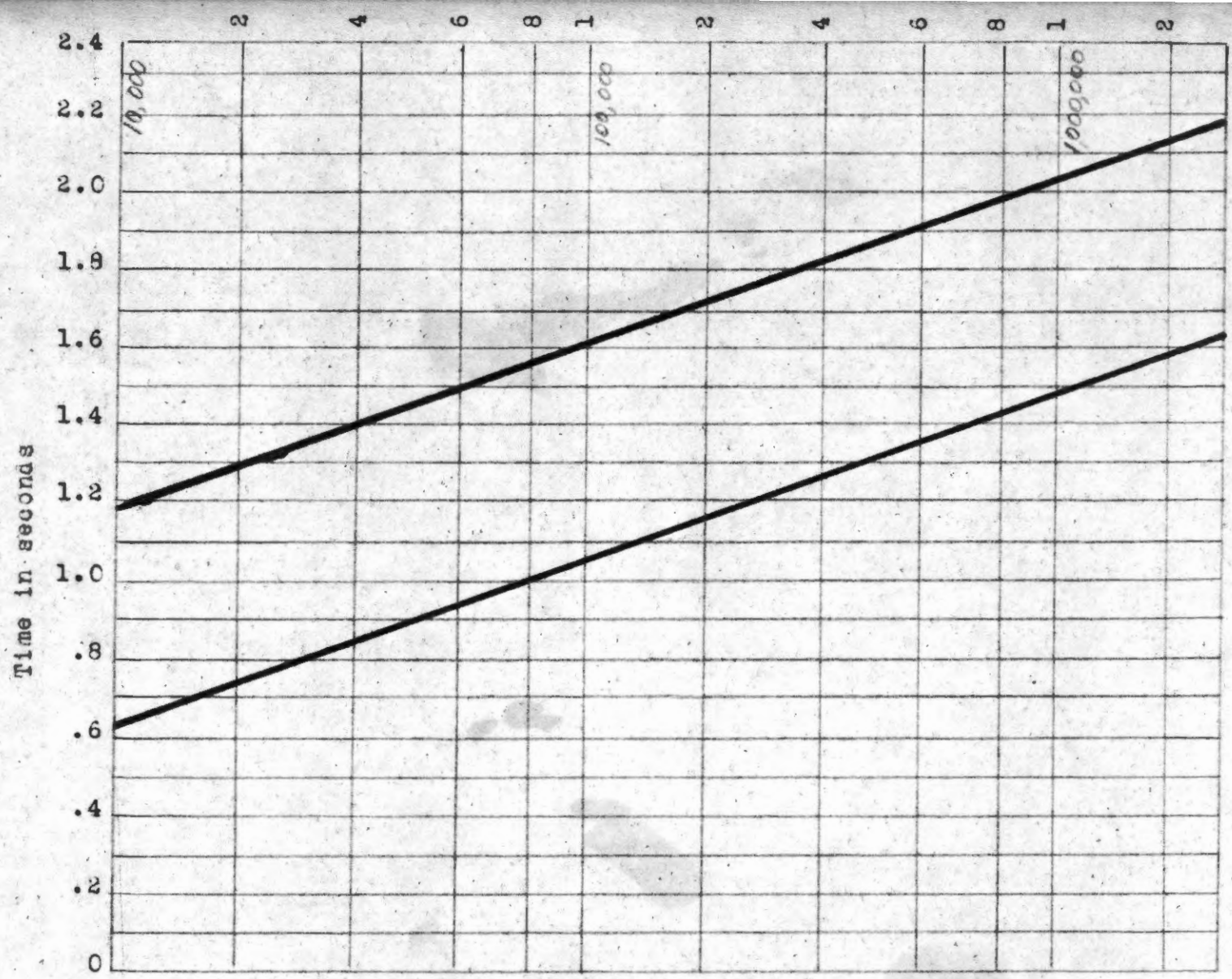

FIGURE 4

DESIREABLE RANGE OF REVERBERATION TIME

Luminaire - A complete lighting unit or fixture consisting of a light source together with its globe, reflector, housing and supports.

Reflection factor - The ratio of light reflected from a surface to the light falling upon it, usually quoted as the per cent of light reflected as measured in foot candles.

The light unit which activates the visual process is the foot lambert. The task becomes visible because of reflected brightness. The brightness is the product of the foot candle intensity and the reflection factor of the task. The foot lambert then, rather than the foot candle, becomes the prime factor in conditioning an environment for visual comfort and efficiency because it is the reflected brightness that we see and not the light falling upon the task.[1]

Study has shown that candlepower is only one condition to take into account and may not be the most important one. Often the light that surrounds the surface the eye is focused in is important. Within the peripheral field the brightness of any surface should not be more than fifty or less than one-fifth of the task. Also, within the surrounding field, the brightness of any surface should not be more than ten times or less than one-fifth that of the task.[2]

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[1] Harmon, op. cit., p. 150.

[2] Ibid., p.147.

The brightness of reflecting surfaces is just as important and dangerous as direct glare, and may be even worse if above or below the working plane. This may be treated by either moving the light or treating the surface.[1] Glossy paint should be avoided. Figure five illustrates the refraction of light from glossy and non glossy surfaces.

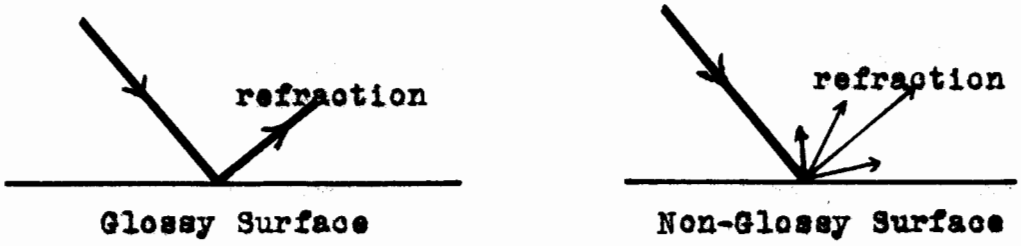

FIGURE 5

REFRACTION OF LIGHT FROM GLOSSY AND NON-GLOSSY SURFACES

[1] E.W. Bollinger, op. cit., p. 136.

A teacher may be pardoned for a lighting installation beyond his control, but there is little excuse for a system, however inadequate, to be poorly maintained. Bollinger[1] lists six principle causes of lighting depreciation.

1. Dirty reflectors
2. Darkened walls and ceilings
3. Lamps of poor quality
4. Empty sockets and unobserved burnouts
5. Under voltage burning of lamps
6. Improper combination of lamp and reflector.

Newkirk[2] states that at least from twenty to thirty foot candles should be delivered at bench tops and machines, and that the best artificial source is incandescent lights using semi indirect ceiling fixtures, placed about ceiling heighth apart, and using 300 watt lamps with an average of 110 square feet of coverage for each outlet.

Waldeck[3] supports Newkirk's recommendations and adds that for dust free areas, either the indirect or filtered fluorescent type of fixture will be found satisfactory.

It is interesting to compare some of the brightnesses on table one. In footlamberts, the intensity of the reflected

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[1] Ibid., p. 137.

[2] L.V. Newkirk and W.H. Johnson, op. cit., p.280.

[3] Waldeck, op. cit., p. 12.

TABLE I

ILLUSTRATIONS OF BRIGHTNESS

ILLUSTRATIONS	FOOT LAMBERTS
Clear sky	1000
Hazy sky	2000
White clouds	3-5000
Sunlight on white building	8000
Sunlight on trees	320
Bare 200 Watt filament lamp	65,000
Enclosing globe	1200
Bare fluorescent lamps (48")	
At 90 degree angle to axis	1900
At 30 degree angle to axis	1400
Shielded fluorescent fixtures (URC)	500
White ceilings above indirect fixtures	
500 watt hung 30" from ceiling	75
500 watt hung 48" from ceiling	55
750 watt hung 48" from ceiling	65
Blackboard with 25 foot candles(10%RF)	2,5

light as it strikes the eye, a bare fluorescent lamp has a maximum of 1900, a shielded fluorescent fixture has only 500. Sunlight on a white building has 8000 and white clouds have a maximum of 5000. The source that has the greatest foot-lamberts by far is the bare 200 watt, filament lamp with 65,000.

Natural light may produce a great many footlamberts, depending upon the reflection factor of the surface. For the reflection factors of paint colors see Figure six. To provide sufficient natural light, Newkirk[1] recommends one square foot of window glass for every five square feet of floor space. Using the recommended minimum of 1500 square feet of floor space means a minimum of 300 square feet of window area. Ultimately, failure to come within the tolerances of the brightness ratio means that the biochemical and psychological nature of the child is disturbed.[2]

Fatigue, eyestrain and hazards can be minimized by proper use of color dynamics. When picking the colors to be used in shops, remembering the psychological effects each group of colors has will make the choice easier. Harrison

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[1] Newkirk and Johnson, op. cit., p. 279.

[2] E.C. Harrison, "Lighting the Industrial Arts Laboratory," Industrial Arts and Vocational Education, March, 1952, p. 90.

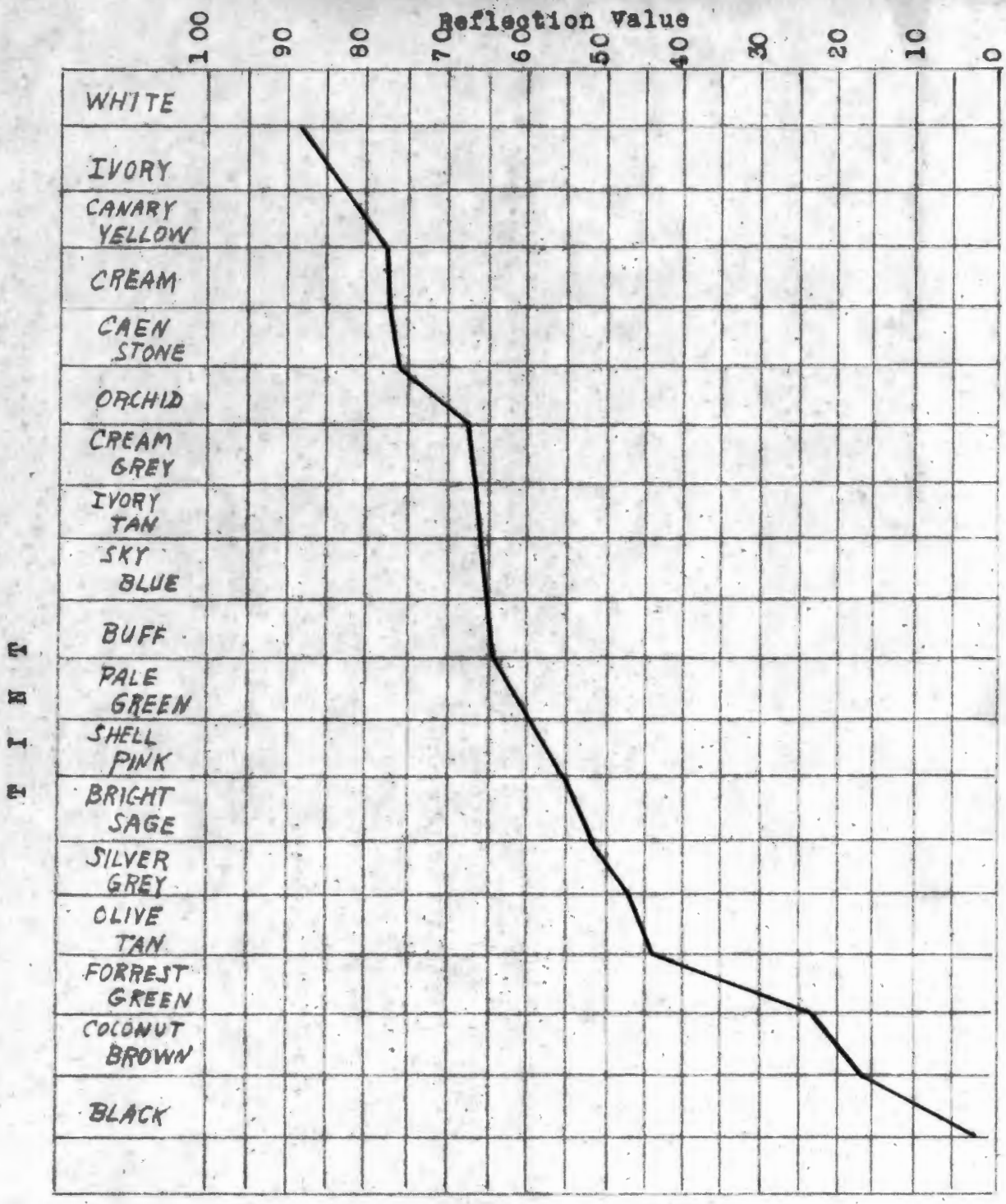

FIGURE 6

REFLECTION VALUE OF VARIOUS TINTS

lists the following colors and their psychological effects.[1]

Yellow tints have a cheering stimulating effect.
Blue has a cooling effect.
Green has the effect of both blue and yellow.
Orange tints only, have the effects of warmth.
Red brings the feeling of danger and excites the person.
Violet and purple have the effects of richness and luxury.

Selecting the right hue, with the proper value and chroma gives excellent results to color rendering. Soderberg lists ten factors resulting from the proper use of colors.[2]

1. Reduces eyestrain
2. Fatigue is minimized
3. Improved lighting
4. Improved appearance
5. Reduces maintainance costs
6. Aids in housekeeping
7. Improved worker morale
8. Improved health conditions
9. Increased quantity and quality of work
10. Personal injuries reduced.

Efficiency and interest can be improved in the shop through a judicious use of color on machines, equipment and walls. Drab shops have no place in the modern school.[3] There are psychological factors which justify and should encourage the use of color throughout the shop. Dull, drab colors are conducive to dirt and disorder; and, conversely,

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[1] Ibid., p. 81.

[2] G.A. Soderberg, "Color Rendering", Industrial Arts and Vocational Education, 1949, p. 106.

[3] Newkirk and Johnson, op. cit., p. 279.

fresh painted machines, walls and floors in agreeable tones create and promote an interest and a desire for maintaining clean and orderly shops. A clean shop is important not only for appearance's sake, but also in helping prevention of accidents.[1]

The philosophy of those who would attempt to claim material educational growth based solely on increased quantities of light at desk top level has been abandoned for a more acceptable approach which takes into consideration the entire visual environment as it effects the physical, mental and emotional welfare of the pupils.[2] Harmon recommends the following colors and their uses.[3]

Yellow - to indicate strike against, stumbling, falling or trip hazards.
Red - To mark instruments to combat fires.
Medium Green - apply to machines, benches and fixed equipment.
Orange - to mark portions of machines that may cause injury.
Blue - to mark equipment under repair.
White, grey or black - to mark facilities for good housekeeping and to direct traffic.
Bright green - to indicate safety equipment.

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[1] C.M. Hansen, "The Psychological Effects of Color Dynamics," Industrial Arts and Vocational Education, March, 1952, p. 103.

[2] R.R. Harmon, op. cit., p. 138.

[3] Ibid., p. 138.

The number and type of electrical outlets has long been an important factor of both physical and psychological safety. Long cords and outlets projecting from the floor are hazardous. The installation of wire ways or plug-in-strips along certain walls, bench height, providing continuous receptacles for electrical tools, extension cords, etc., will further add to the flexability of the shop.[1] Electrical outlets should be provided for both 220 volts and 110 volts and of sufficient capacity to prevent damage from overload. When the more conventional 110 volt double wall receptacles and the 220 volt single wall receptacles are used, the minimum number of 110 volt outlets are one every fifteen feet and a 220 volt outlet every ten feet.[2] The newer lock-in type are satisfactory, since the machine or extension cord will not become unplugged accidentally. The plugging in or unplugging of a machine when the switch is on is extremely dangerous due to the amperage while machines are in operation. All power machines should be grounded and all metal furniture insulated.[3] A student coming in contact with a 220 volt

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[1] Waldeck, op. cit., p. 72.

[2] Stoneman, et al., op. cit., p. 123.

[3] Ibid., p. 123.

machine which is short circuiting to the frame may be very seriously injured. A teacher who will take the time to explain some of the theories of electricity and the proper use of motor driven machines will not have to make as many rules or waste as much time in fuse and motor maintainance and will have a safer shop.

Fires are often caused by faulty electrical conditions and are sometimes quickly brought under control if the proper fire extinguisher is easily available and used correctly. Fires are divided into the following classes, each class designated by the nature of the substance that may be burning.[1]

> Class A - Comprising of combustable material, such as wood, textiles and rubbish, where quenching and the cooling effects of quantities of water, or solutions containing large portions of water, are of first importance.
>
> Class B - Comprising of flamable liquids, oils and grease, where a blanketing and cooling effect is essential.
>
> Class C - Comprising of fires in electrical equipment where the use of non conducting, smothering and cooling extinguishing agents are necessary.

Fire extinguishing agents are composed of chemicals and chemical mixtures which can be used on the types as indicated in table two.

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[1] New York (State) University, Bureau of Vocational Curriculum Development and Industrial Teacher Training, Shop Safety Education (New York: Delmar Publishers, 1949), p. 45.

TABLE II

EXTINGUISHING AGENT FOR DIFFERENT CLASS FIRES

CHEMICAL OR CHEMICAL MIXTURE	CLASS A	CLASS B	CLASS C
Water and water fog	X		
Water and foam	X	X	
Water, soda and acid	X		
Carbon dioxide gas and water	X	X	
Carbon dioxide gas alone		X	X
Carbon tetrachloride	X	X	X
Sand and dry chemical powders	X	X	X

It is advisable for each teacher to orient all students on what they should do in the case of fire. When students fight fire, safety comes above everything else. If the student who first notices the fire can extinguish it by the use of a nearby extinguisher, he should. However, if the blaze gets out of control or there is evidence of causing bodily harm to the student, he should sound the alarm and evacuate the building. Only in remote cases such as rural areas should students be trained and expected to fight fire. Under these conditions the teacher or someone else must take it upon themselves to see that things are properly organized and the students are satisfactorily trained.

An organized plan to help in the routine duties about the shop shows efficiency, creates a sense of loyalty and promotes responsibility in the students. It is an effective means of cleaning up at the end of the period and initiates some good housekeeping habits. Gammons lists five requirements for a successful organization:[1]

1. It must be democratic in principle and function.
2. It must relieve the instructor of the myriad of managerial duties which do not allow him to teach.
3. It must evolve out of and meet the needs of a specific situation.
4. It must be tried out and altered until it functions effeciently in the given situation.
5. It must be of educational value to the students to justify its existence.

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[1] B.T. Gammons, "Shop Personnel Organization", Industrial Arts and Vocational Education, September, 1949, p. 273.

Many methods are used to execute a shop personnel organization plan. The teacher may appoint or the class elect a foreman for a stated term and he makes up the lists of what each student is responsible for doing. The teacher could make up the lists and the foreman check to see that the work is done. The wheel, shown in Figure seven is a popular method. Besides indicating specifically what each boy is to do, the job may be changed at any time by rotating the wheel. This relieves the student foreman or the instructor from making up work lists too often.

The success of a shop organization is dependent upon the existence or development of the right attitude toward it. There must be a continuous and conscientious effort on the part of the teacher to maintain this attitude.[1]

Shop accidents, including vocational shops, constitutes 8.3 per cent of the total accidents in the junior high school and 9.9 per cent in the senior highschool.[2] Numerous research studies, based upon frequency rates, show that the woodworking area is relatively more dangerous than all other shop areas. The percents and areas are as follows:[3]

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[1] Ibid., p. 274.

[2] "Where Junior and Senior Highschool Accidents Take Place", Safety Education, 30:28-31, January, 1951.

[3] Ibid., p. 28.

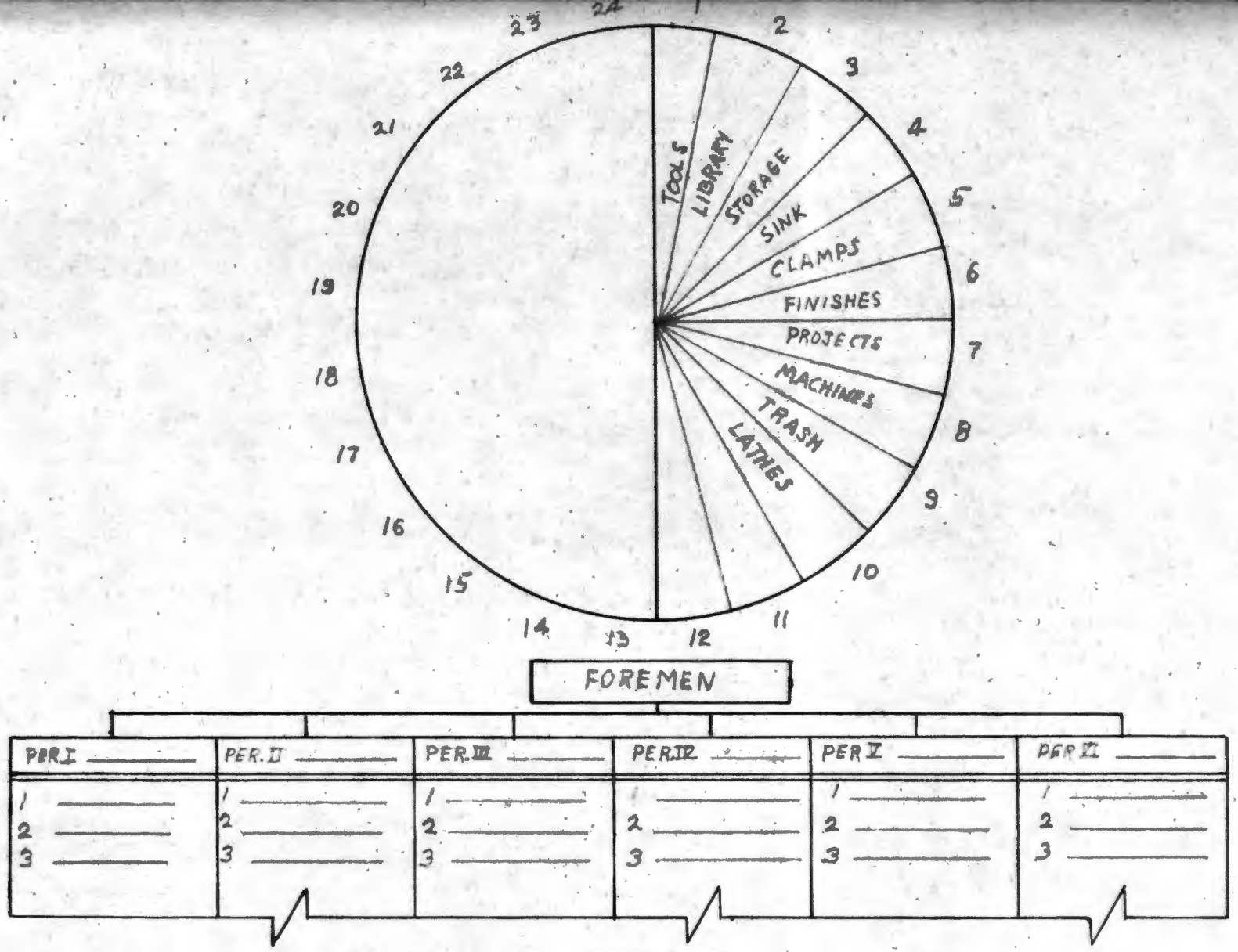

FIGURE 7

ROTATING SHOP ORGANIZATION WHEEL

Wood	12	per cent
Metals	11	
Transportation	6.6	
Communications	5.9	
Graphic arts	3.3	

The relationship of all shop accidents to all school accidents is expressed in Figure eight. In a survey report of 7,144 school accidents over a nine months period involving 743,800 pupils, the National Safety Council listed the five areas involving the greatest number of accidents in the eleventh grade as:[1]

1.	Laboratories (total in building)	60.9
2.	Gym (other than basketball)	19.4
3.	Basketball	10.9
4.	Shops	9.3
5.	Classrooms and auditoriums	5.3

Accidents are divided into two general classes: (a) caused by faulty conditions of the room and equipment and (b) caused by inefficient instruction and management. The conditions within the room that contribute to these causes are listed in Table three.

The peak year for accidents is the seventh grade. Figure nine shows the rate and seriousness of accidents by grade and by month of the year of 500,000 New York City pupils.[2]

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[1] American Association of School Administrators, Department of the National Education Association, 27th Year Book, 1949, p. 171.

[2] E.B. Siebrecht and H.J. Stack, Education for Safe Living (New York: Prentice Hall, Inc., 1942,) p. 139.

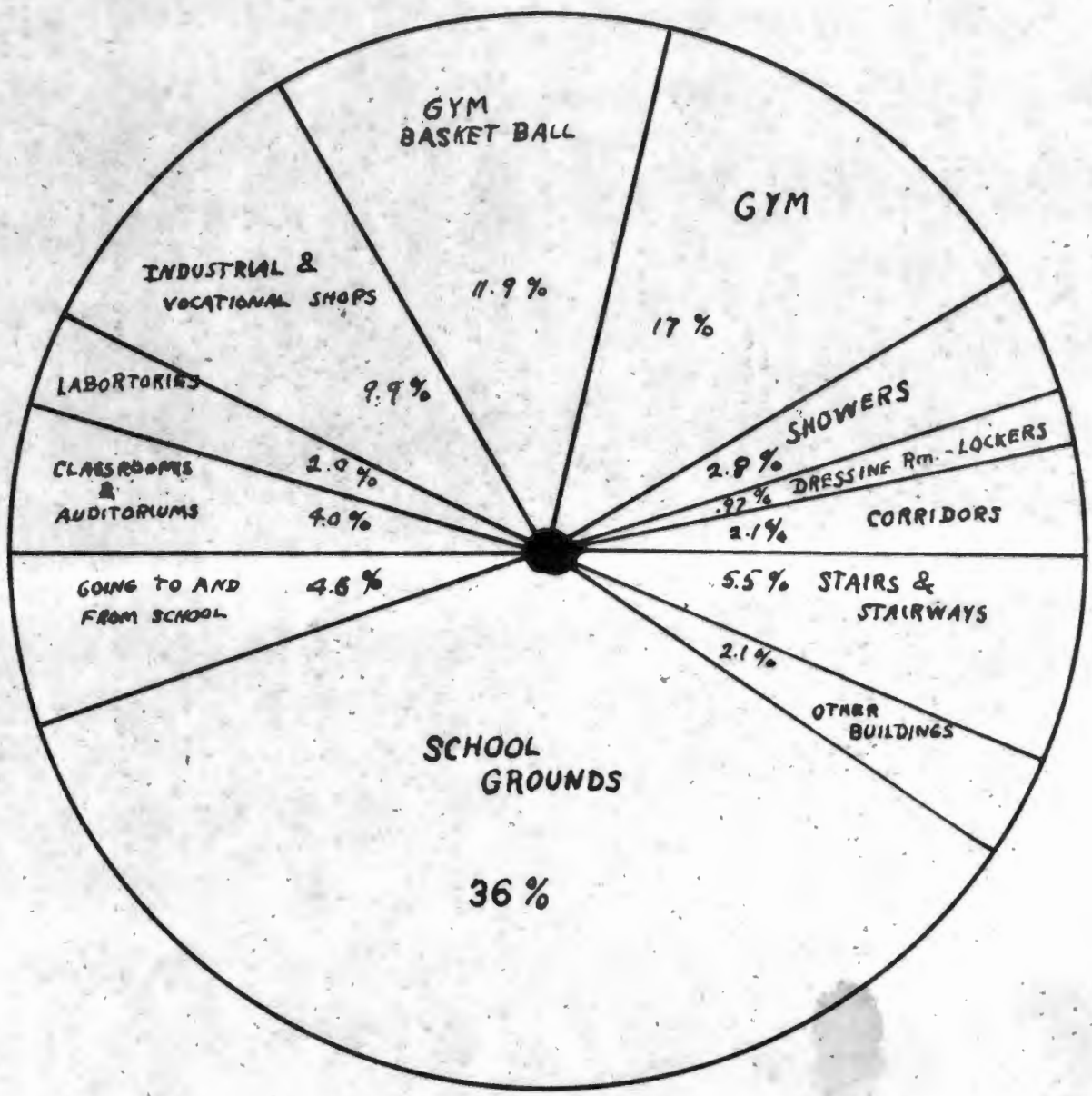

FIGURE 8

WHERE SCHOOL ACCIDENTS HAPPEN

TABLE III

CAUSES OF ACCIDENTS

A. Faulty conditions of the room and equipment	B. Inefficient instruction and management
1. Low ceilings	1. Lack of teacher knowledge
2. Poor light	2. Inadequate preliminary instruction
3. Bad location of machines	3. Failure to follow up on instruction
4. Unguarded belts	4. Allows students to play in shop
5. Unguarded gears, pulleys, etc.	5. Overtime work without supervision
6. Dull machines	6. Allowing guards to be removed
7. Unguarded switches	7. Allowing experimentation on machines
8. Waste and scrap stock on floor	8. Improper attitude of students
	9. Failure to check setup before operation

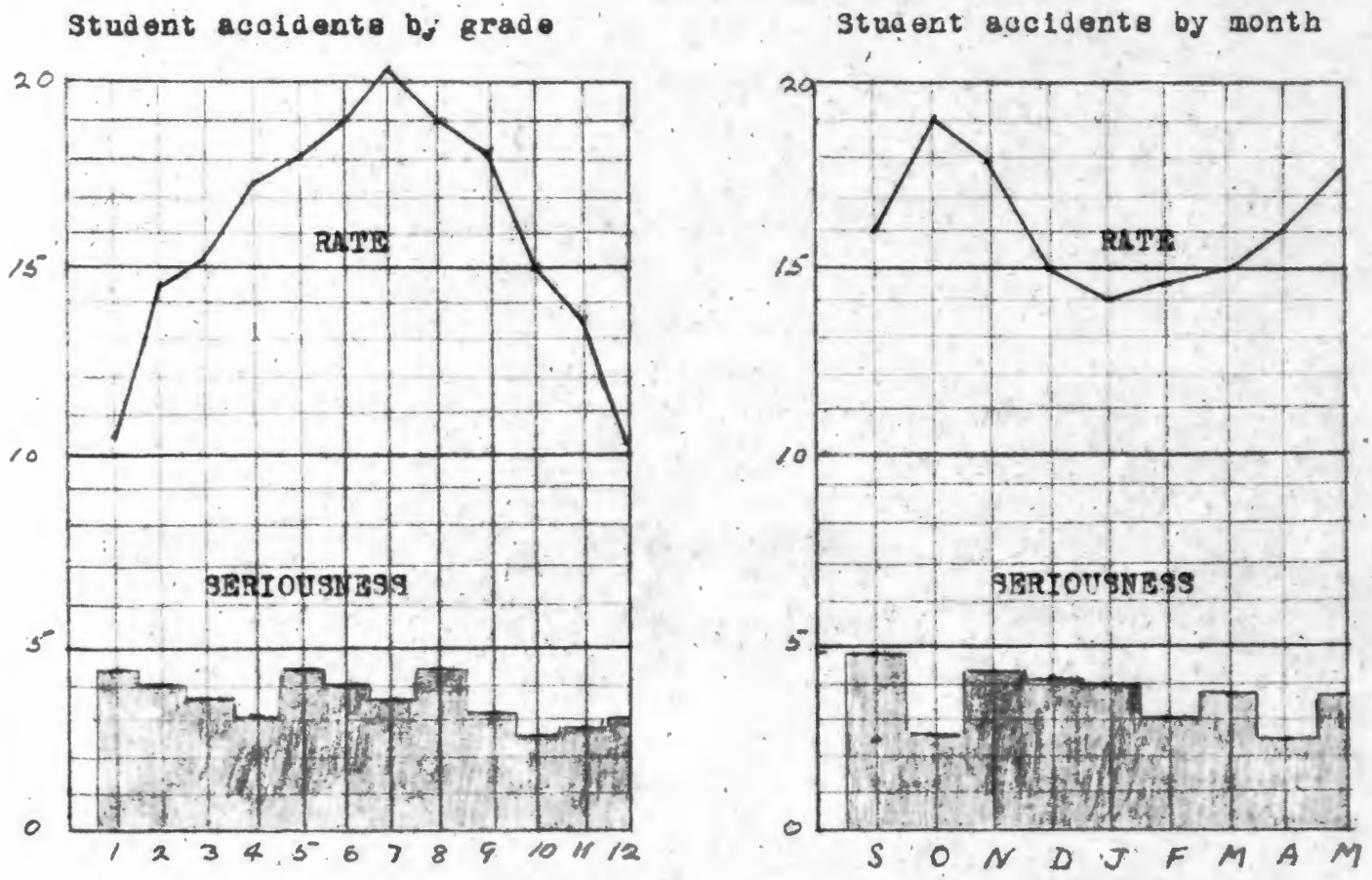

FIGURE 9

RATE AND SERIOUSNESS OF ACCIDENTS BY GRADE AND BY MONTH

Accident prevention instruction should be based on the presumed hazards of an eventual individual environment rather than on the relatively non hazardous actualities of the school situation.[1] Some tools and equipment are naturally more dangerous than others. Table four indicates the tool and the accident frequency in the Detroit Public Schools for the school year 1937-38.[2] It is interesting to note that the saw is by far the most dangerous piece of equipment but that over twice as many accidents occurred where no equipment was involved.

Habits and attitudes toward safety may be formed if an effort is made. It is up to the teacher to set the stage and to bring safety to the attention of the students in every way feasible. The following methods are among the most helpful in developing good safety habits and attitudes.

1. Showing the learner how to perform his work safely.
2. Demonstrating how accidents are caused and prevented.
3. Accident reporting.
4. Visual lessons.
5. Safety campaigns.

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[1] Ibid., p. 139.

[2] Ibid., p. 139.

[3] F.T. Struck, Vocational Education for a Changing World (New York: Wiley and Sons, Incorporated, 1945), p. 355.

TABLE IV

TOOL AND ACCIDENT FREQUENCY

EQUIPMENT	NUMBER OF INJURIES
Acid	1
Anvil	1
Auto	1
Bit	3
Boards	1
Buffer	1
Chisel	8
Gouge	2
Grinder	15
Hammer	2
Jointer	2
Knife	19
Lathes - metal	14
Lathes - wood	9
Lumber rack	1
Milling machines	2
NO EQUIPMENT	86
Press - drill	2
Press - print	4
Saw	35
Scraper	0
Shears	0
Vise	4
Welding	2

Preliminary reports should be made of every school shop accident no matter how minor in character because minor injuries may become serious through infection. Also, each accident should be discussed by the teacher and students to determine possible causes, losses, responsibilities and the prevention of a reoccurence.[1] Figure ten shows the accident report as adopted and recommended by the National Safety Council.

Some students are naturally safety conscious in the shop and assume that responsibility well while others need special attention. The kinds of students who require special care in preventing accidents may be classified as:[2]

1. The student day dreamer.
2. The student who is a social misfit.
3. The student who is not interested.
4. The student who is emotionally unstable.
5. The student who is a slow learner.
6. The student who is physically handicapped.

Teachers and students may work cooperatively toward safety but be held back by the administrator. The most important single thing an administrator can do in the school shop is to promote the proper attitude toward safety.[3]

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[1] Ibid., p. 350.

[2] New York (State) University, op. cit., p. 109.

[3] Wilber, op. cit., p. 265.

STANDARD STUDENT ACCIDENT REPORT FORM
PART A. Information on all Accidents

1. Name _____ Home address _____

2. School _____ Sex: M __ F __ Age Grade or classification _____

3. Time accident occurred: Hour ___ A.M. ___ P.M. Date _____

4. Place of accident: School Building __ School Grounds __ Home __ Elsewhere __.

5. NATURE OF INJURY

Abrasion	___	Fracture	___
Amputation	___	Laceration	___
Asphyxiation	___	Poisoning	___
Bite	___	Puncture	___
Bruise	___	Scalds	___
Burn	___	Scratches	___
Concussion	___	Shock(elec.)	___
Cut	___	Sprain	___
Dislocation	___		
Other (specify)	_____		

PART OF BODY INJURED

Abdomen	___	Foot	___
Ankle	___	Hand	___
Arm	___	Knee	___
Back	___	Leg	___
Chest	___	Mouth	___
Ear	___	Nose	___
Elbow	___	Scalp	___
Eye	___	Tooth	___
Face	___	Wrist	___
Finger	___	Head	___
Other(specify)	_____		

Description of the accident
How did accident happen? What was student doing? List specifically unsafe acts and unsafe conditions existing. Specify any tool, machine or equipment involved. _____

6. Degree of injury: Death Permanent Impairment ___ Tempory Disability ___ Nondisabling ___

7. Total number of days lost from school _____ (To be filled in when student returns)

PART B. Additional information on school jurisdiction accidents

8. Teacher in charge when accident occurred (Enter name here): _____
Present at scene of accident: No ___ Yes ___

9. IMMEDIATE ACTION TAKEN

First aid treatment	___	By (name)	_____
Sent to school nurse	___	By (name)	_____
Sent home	___	By (name)	_____
Sent to physician	___	By (name)	_____
Physician's name			_____
Sent to hospital	___	By (name)	_____
Name of hospital			_____

10. Was a parent or other individual notified? Yes ___ No ___ When ___ How _____
Name of individual notified _____
By whom (enter name) _____

11. Witness: 1. Name: _____ Address: _____
2. Name: _____ Address: _____

12. LOCATION

Specify activity		Specify activity	
Athletic field	_____	Locker	_____
Auditorium	_____	Pool	_____
Cafeteria	_____	Sch. grounds	_____
Corridor	_____	Shop	_____
Classroom	_____	Showers	_____
Dressing room	_____	Stairs	_____
Gymnasium	_____	Toilets and washrooms	_____
Home Economics	_____	Other(specify)	_____
Laboratories	_____		

Remarks:
Recommendations for preventing this type of accident: _____

Signed: Principal _____ Teacher _____

FIGURE 10

NATIONAL SAFETY COUNCIL STUDENT ACCIDENT REPORT FORM

This attitude if developed in the mind of the student will be a more valuable tool to him than a knowledge of all the guards and safety precautions. Eighty per cent of all shop accidents are caused by unsafe acts by individuals who have a faulty attitude toward safety.[1]

The two chief causes of accidents are (a) the physical environment in which the accident occurs and accounting for ten per cent of all shop accidents and (b) the acts of the individual which accounts for eighty-eight per cent of all shop accidents. The part the student and the shop provides and the results are further indicated in Figure eleven.

The legal responsibilities of the teacher may be defined definitely by the law or may come under negligence. Tischendorf defines neglect as ..."failure to act as a reasonably prudent and careful person would under the circumstances involved."[2] The exact conditions constituting liability is determined by the courts. Under conditions which the teacher may be considered negligent, absence of the teacher from the shop while the students are in the shop, rates highest. The teacher is most apt to be consider neg-

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[1] Ibid., p. 265.

[2] E.W. Tischendorf, "Accident Liabilities of Shop Teachers," Safety Education, 30: 1-3, February, 1951.

The student provides	His heredity background	His environmental background
The shop provides	The mechanical or physical hazard	The mental hazard
The results may be	The accident	The mental collapse
Which in turn can lead to	The physically injured student	The eventually injured student

FIGURE 11

THE SCHOOL SHOP ACCIDENT

ligent if an accident occurs while he is out of the shop.

When legal action is taken against a teacher it not always is a matter of whether or not he was negligent, but often one of whether or not he can give evidence showing he was not. The shop teacher must have adequate proof that each and every boy has had sufficient safety instruction.

Printed rules and regulations do not meet the legal problem of safety in a shop. Every shop teacher should have a written evidence bearing the students signature that complete and thorough safety instruction has been given. Following instruction and testing a student may be required to sign a comprehensive statement indicating such instruction, the specific dates, machines covered, etc.[1]

Each state is different in its laws regarding the responsibility of the teacher and the school district. Teachers should become acquainted with the laws in the state they are teaching in. The Washington State law states that action may be maintained against a school district; however, there are exceptions. Liability of the industrial education teacher seems to be an exception.[2] The Washington State Law

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[1] J.W. Rathbun, "Moral and Legal Aspects of Safety Education," Industrial Arts and Vocational Education, 11:379, November, 1946.

[2] Rathbun, op. cit., p. 379.

reads:[1]

> No action shall be brought or maintained against a school district or its officers for any noncontractual acts or omissions, of such district, its agents, officers or employees, relating to ..., or manual training equipment, whether situated in or about the schoolhouse or elsewhere, owned, operated or maintained by such school district.

When accidents do occur, first aid is usually given. This should be done by the teacher or a nurse and an accident report filled out. Courses in First Aid such as the one offered by the American Red Cross will enable the teacher to do this work proficiently and with more assurance.

There are many methods of teaching safety as part of the shop work. Coverage of the more common shop tools and machines with specific suggestions and rules for each machine and precautions that must be taken in the various areas should be part of the course. Ready made charts such as the Stanley Safety Charts are helpful, or the teacher may wish to make his own. Students often have good ideas and will draw clever posters. On the spot analysis is suggested as a most effective method of correcting unsafe practices.[2] Again, no method or idea is a complete answer to the question.

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[1] Ibid., p. 379.

[2] New York (State) University, op. cit., p. 251.

CHAPTER IV

SCHOOL SHOP CONDITIONS

In order to compare recommendations with the existing conditions in the junior and senior high school woodshops in the County of Yakima it was necessary to find the answer to many questions. For anyone to answer these questions for a particular school required considerable counting, measuring and time. Also, some of the questions needed interpretation. In view of the type of questions, the time involved in answering them and the interpretation involved, the writer decided the best results could be obtained by compiling a list of the major points to be considered in surveying a shop for safety, set this list up to facilitate the recording and tabulating, and then to take this survey around to each school and fill it out. The writer filled in all the information that was concrete. The conclusions that were a matter of opinion were discussed with the teacher of that particular shop and the result arrived at jointly between the interviewer and the teacher. The writer accomplished two major factors by taking the survey himself. First, there was a 100 per cent response to every question which is most difficult in any other type of survey and second, the interviewer acted as a stabilizer in the interpretation and answering of the questions.

Throughout the entire period of accumulating the statistical data for the survey the writer kept the human element out of the survey as far as possible. Existing figures and facts were used in every case except in those requiring a decision, and then this decision was kept unbiased.

The physical make up of the original survey form was not difficult. The questions were listed vertically on the left side of a three foot piece of 18" butcher paper with horizontal lines separating the questions. The schools, as surveyed were listed across the top with vertical lines separating each school. Very few differences occur between the original survey and the one that appears in this text except in the case of total areas involved in which case the separate dimensions only were recorded at first and the totals figured at a more convenient time. The actual name of the school appeared on the original survey and was later transferred to a letter. To expedite figuring averages and to establish a system for grading, the following condition-number ratio was used:

Excellent	4 points
Good	3 points
Fair	2 points
Poor	1 point
Below standards	0 points

Many questions contribute to the overall picture of the shops in the County that do not lend themselves to accumulative charts and graphs. Figures 12 through 17 represent

twenty-five major questions of the survey and may be used to formulate a quick, clear picture of the conditions of the shops even though it does not include all of the questions of the questionaire. Figure 12 shows the schools not meeting the required standards established for each question.

Graphically, Figure 13 shows the per cent of questions any particular school at least came up to the minimum or the rating of each school to the questions collectively. It may be seen that the range is from 28 per cent for school C up to 80 per cent for school G. The average for the county was 50.44 per cent. Figure 14 indicates graphically how each question rated to the total schools or gives the rating of the schools collectively to each particular question. Here it may be seen that the range is from 0 per cent of the schools coming up to the basic requirements of having adequate exhausts, question five, up to 100 per cent of the schools having adequate lighting in secondary areas, question 14.

Figure 15 shows the per cent of shops in the County falling below the standards for each question. In Figure 16 these questions are arranged in descending order of the per cent falling below minimum.

The survey shows a total of 202 power tools used, falling under sixteen different types. Figure 17 shows the total number of each kind of machine, the number with one or more guards missing and the per cent without guards. The

percentage is shown graphically in Figure 18. The survey found that thirty-four out of the 202 machines, or 17 per cent were without proper guards.

In interpreting Figures 17 and 18 the reader should bear in mind that some of the machines do not have guards, such as the belt sander, hand router and hand drill. Also, there is much controversy about guards on the table saw. All authorities recommend saw guards, anti kickback attachments and splinter fingers, but most men in the field state that for general shop use these attachments are impractical to the extent they are not used. The 62 per cent of table saws indicated as being substandard by the survey is only that low due to the number of junior high schools included in the survey which do not use this saw as extensively as the senior high schools.

Figure 17 also indicates that of the sixteen types of machines listed in the county only seven types, as shown in Figure 18 are deficient. When considering these seven types of machines alone, the average with guards missing jumps up to 30.6 per cent. It is interesting to note that the jig saw, which is considered one of the first power tools for beginners, rates second only to the table saw in guards missing.

The condition of the power tools is about equal to that of the hand tools; in both cases at least 50 per cent

of the schools indicating good or better rating. In both power and hand tools two-thirds of the schools indicated they had sufficient of each to carry on their course of study. Figure 19 shows this information graphically.

The term painting and finishing facilities was interpreted as being any central place designated as an area for this purpose. Twelve of the 18 schools had such an area; only two had fireproof storage, and only two of the 5 schools using a spray gun had adequate exhausts. This information along with the results of the other questions pertaining to this area is shown graphically in Figure 20.

The results of the lighting conditions of the eighteen schools shows that 10 had adequate lighting at the bench tops. The figure taken as adequate was 30 foot candles.[1] Eleven schools had 50 foot candles at the machines and all schools had at least 14 foot candles in the secondary areas. This is shown graphically in Figure 21.

All instructors had at least a Bachelor's degree and two had the Master's degree. However, four or 22.3 per cent did not have either a major or minor in industrial arts. One-half of the teachers indicated they had extra curricula activities outside of the shop requiring at least one hour

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[1] Editor, "Lighting for Shops and Special Classrooms," National Education Association Bulletin,(National Education Association Research Division) February 1947.

per day. It was gratifying to note that seven or 38 per cent were working toward an advanced degree or certification. Figure 22 shows this information graphically.

Much more information is contained in the survey and may be obtained by studying it directly. As an example of the information that can be derived directly from the survey it may be noticed under lighting for school C that the foot candles are below recommendation on the machines and benches, that the ceiling is only seven feet high, that clear light bulbs were used every 8 X 10 feet and that the total amount of window area is only 13.5 square feet for 1,050 square feet of floor area. This means that this shop had .064 per cent of the amount of recommended window space and that the artificial light was coming from a source at eye level with over eight times the amount of glare produced by direct sun shining on a white building. This room is dangerous.

QUESTION	SCHOOL																	
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
1			x						x			x	x				x	x
2			x			x	x	x	x	x			x		x	x	x	x
3	x	x	x	x	x	x		x	x	x	x	x		x	x	x		x
4	x	x	x	x	x	x		x	x	x	x	x	x	x				
5	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
6	x	x	x	x	x				x		x							
7		x	x	x	x	x					x							
8		x		x		x		x			x	x		x			x	
9		x		x		x				x	x	x		x			x	x
10	x	x	x	x	x			x	x		x	x	x				x	
11	x		x					x	x		x	x						
12	x		x	x		x			x			x		x			x	
13	x		x	x		x			x			x		x			x	
14																		
15		x	x	x	x	x	x	x	x	x	x	x	x		x	x	x	
16			x					x	x		x	x		x				
17	x	x	x	x	x	x	x			x		x		x			x	x
18			x								x	x					x	
19	x	x	x	x	x	x		x	x	x		x	x	x	x	x	x	x
20			x		x	x	x			x								
21		x			x			x						x				x
22		x			x	x		x	x	x	x	x	x	x	x	x	x	x
23	x	x	x	x	x	x		x	x	x	x	x		x	x	x		x
24					x	x						x		x			x	x
25	x					x									x			

FIGURE 12

SCHOOLS NOT MEETING THE MINIMUM STANDARDS

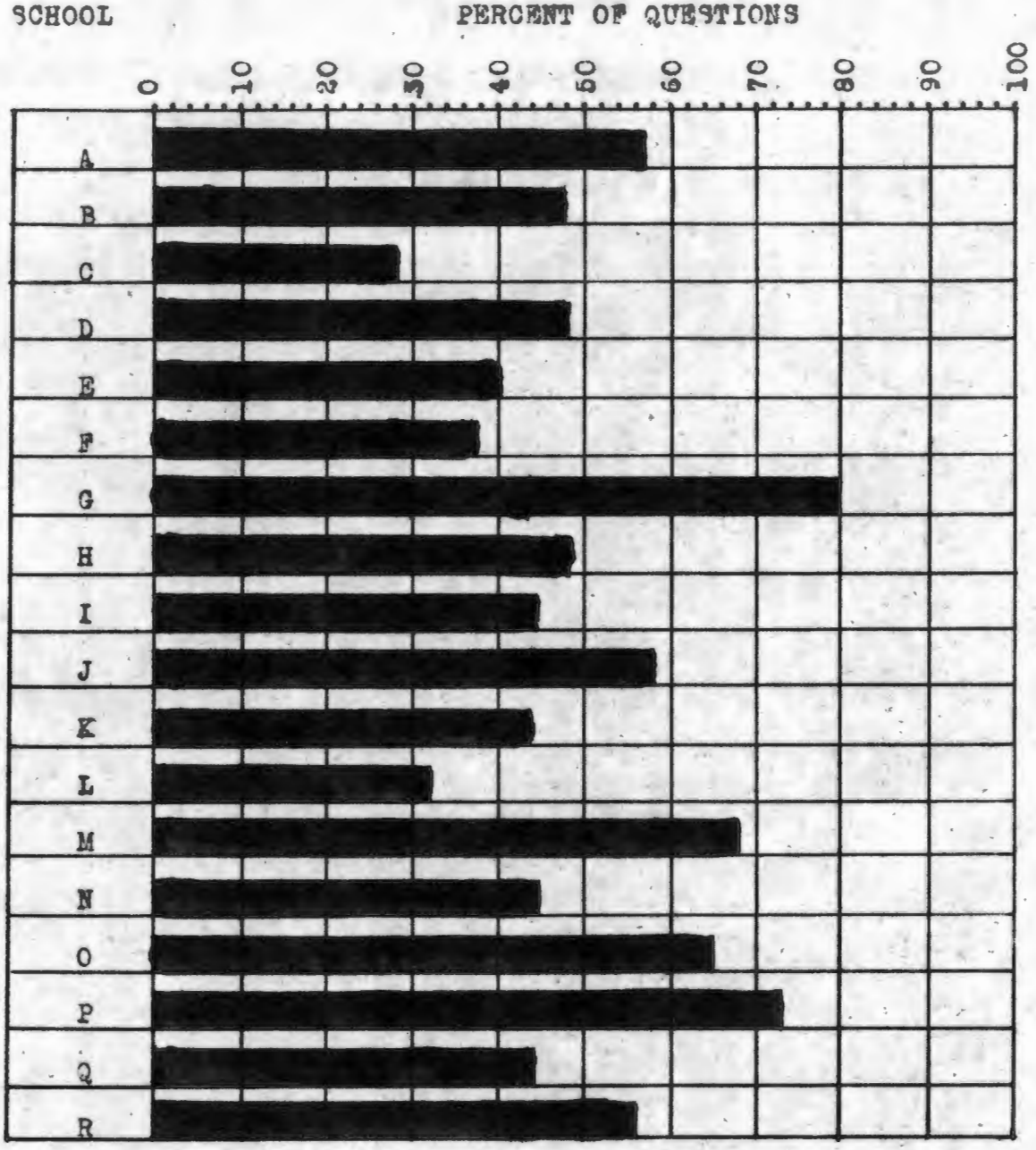

FIGURE 13

RATING OF EACH SCHOOL

(Percent above minimum)

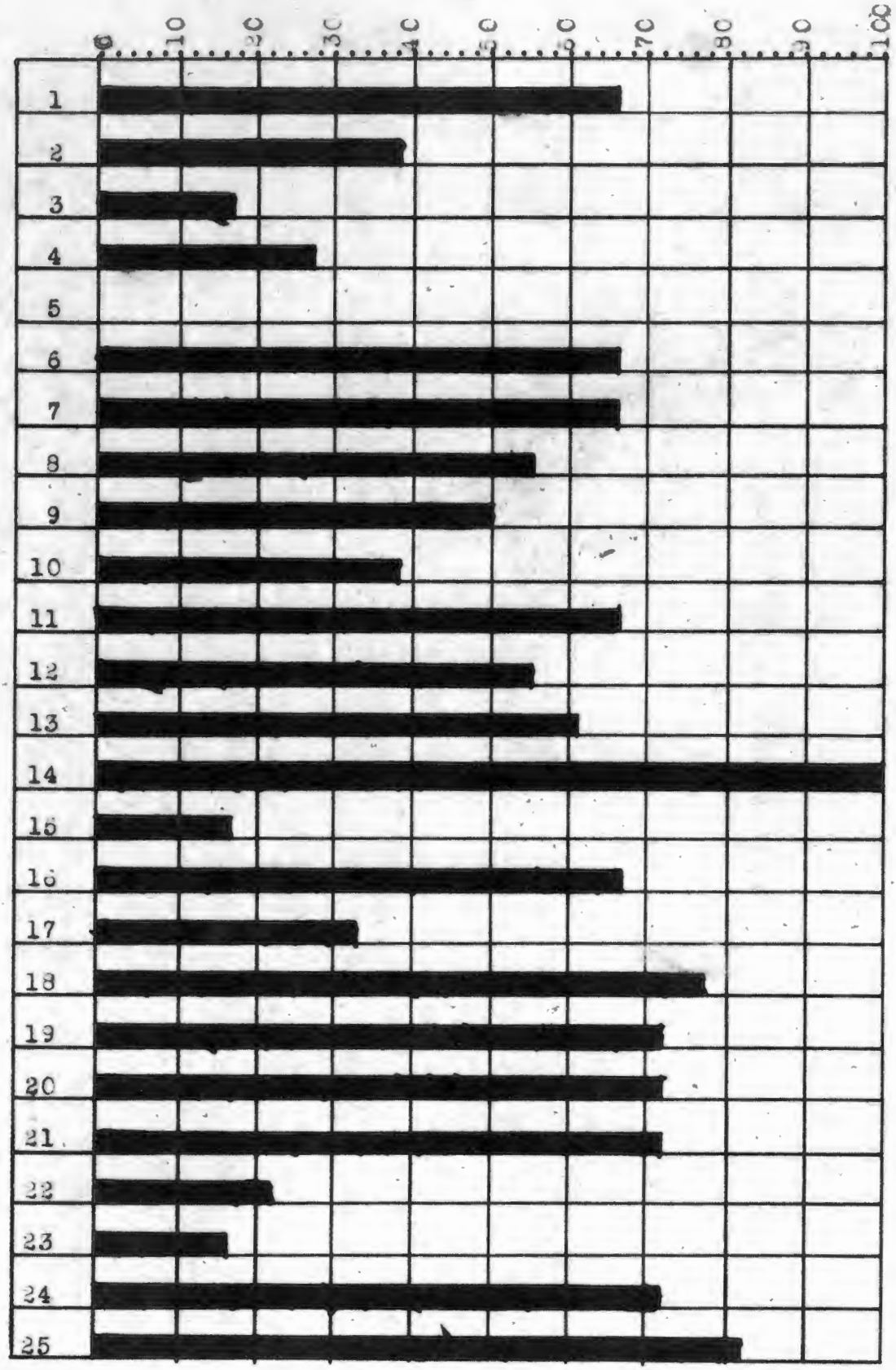

FIGURE 14

RATING OF EACH QUESTION

(Percent of schools above minimum for a particular question)

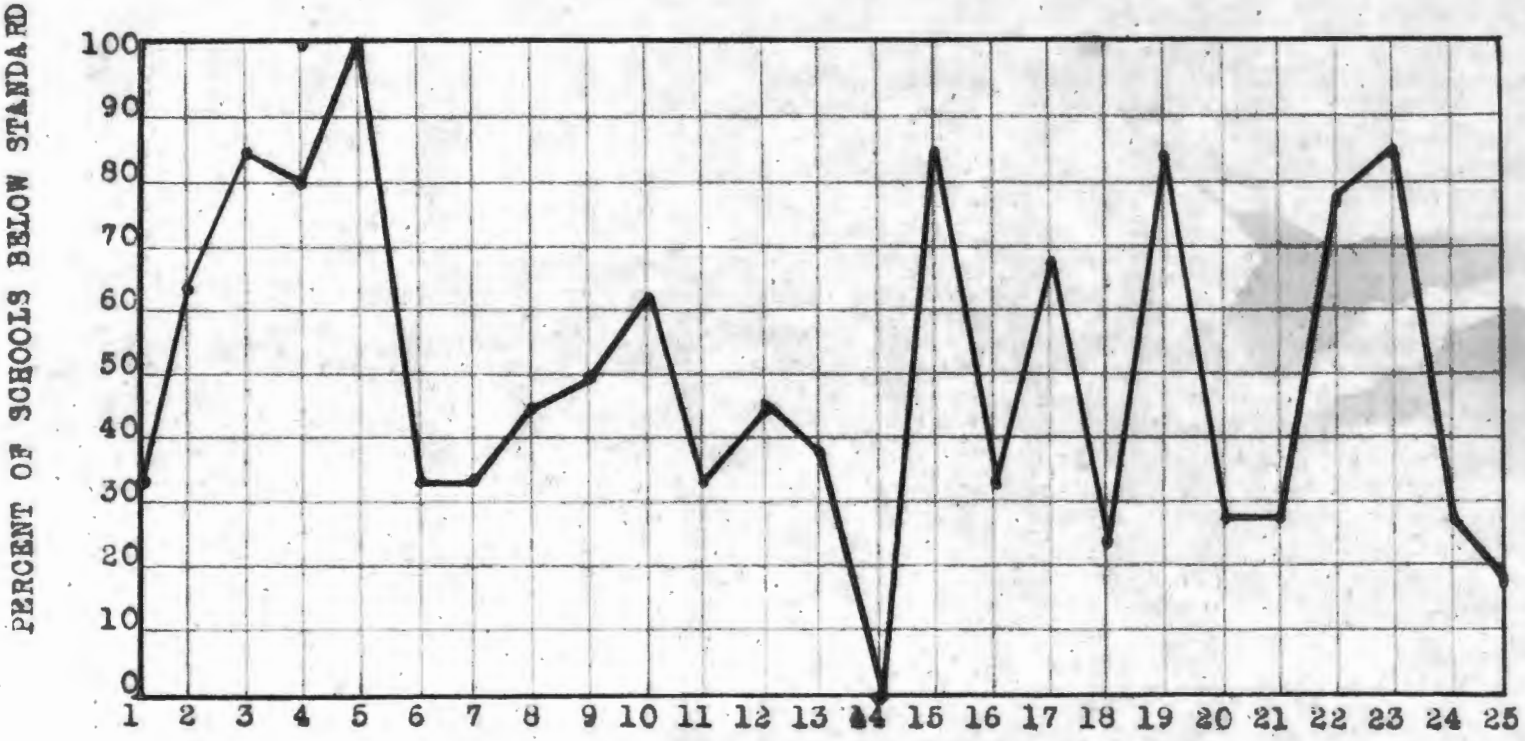

FIGURE 15

HOW TOTAL SCHOOLS RATE FOR EACH QUESTION

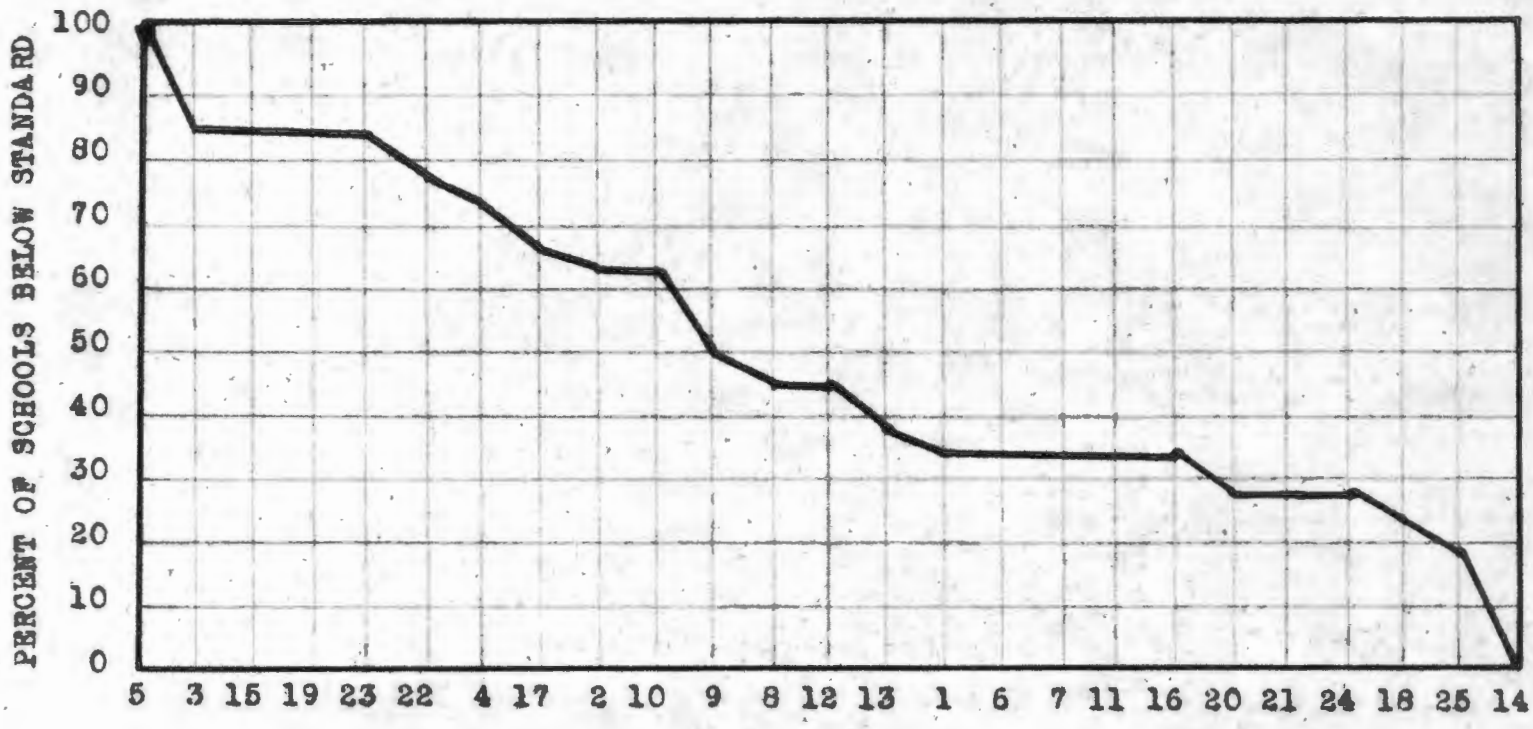

FIGURE 16

QUESTIONS ARRANGED IN DESCENDING ORDER

MACHINES	Total in County	Total Below Standard	Percent Below Standard
Saw	21	13	62
Wood Lathe	38	9	24
Disk Sander	7	2	29
Belt Sander	18	0	0
Stationary Sander	3	0	0
Emery Wheel	17	3	18
Jigsaw	17	6	35
Bandsaw	18	3	17
Sandstone	2	0	0
Jointer	17	5	29
Surfacer	3	0	0
Hand Router	10	0	0
Table Router	7	0	0
Hand Drill	6	0	0
Drill Press	14	0	0
Lap Saw	4	0	0
TOTAL	202	34	17

FIGURE 17

QUANITY AND TYPES OF MACHINES

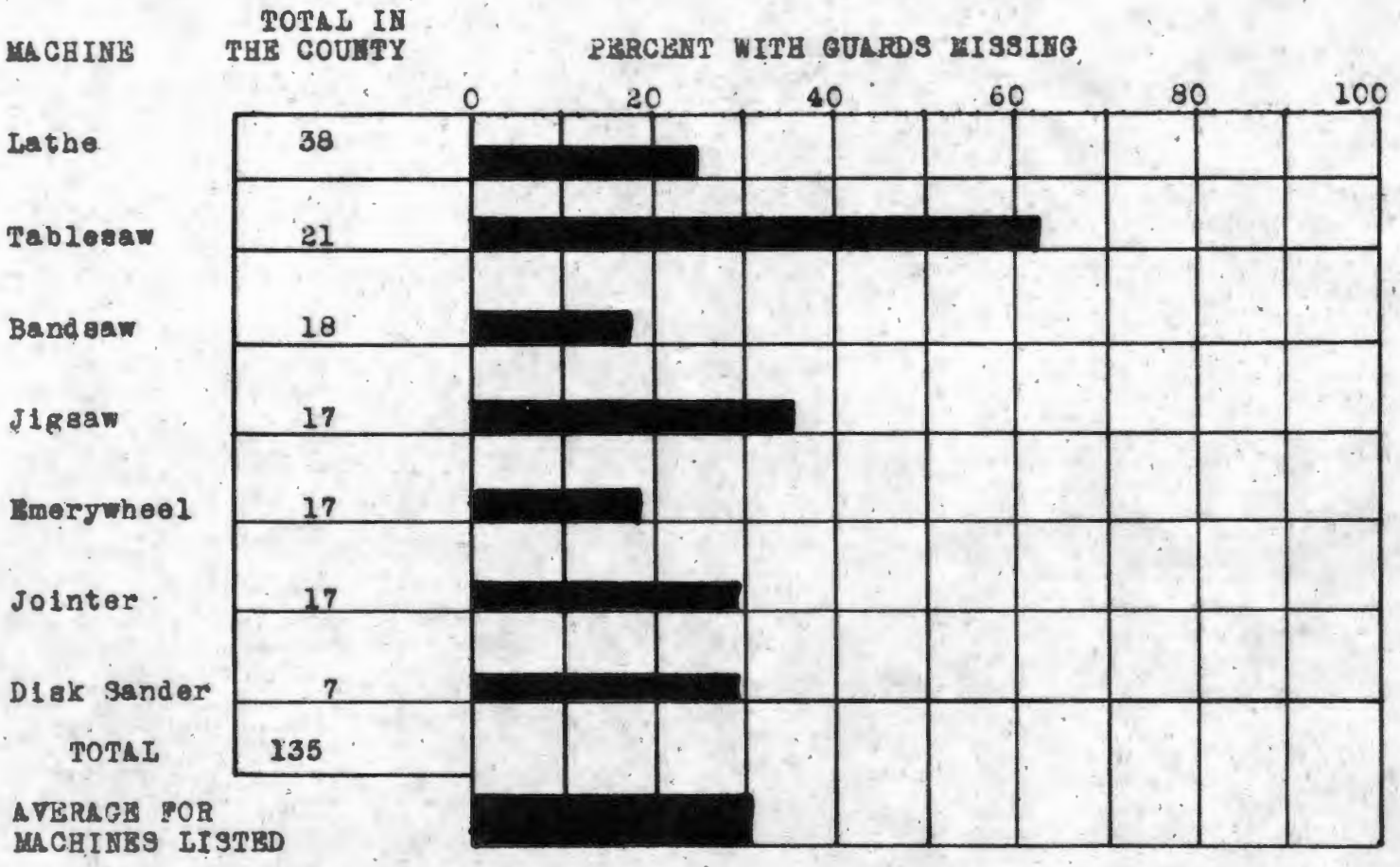

FIGURE 18

SUBSTANDARD MACHINES

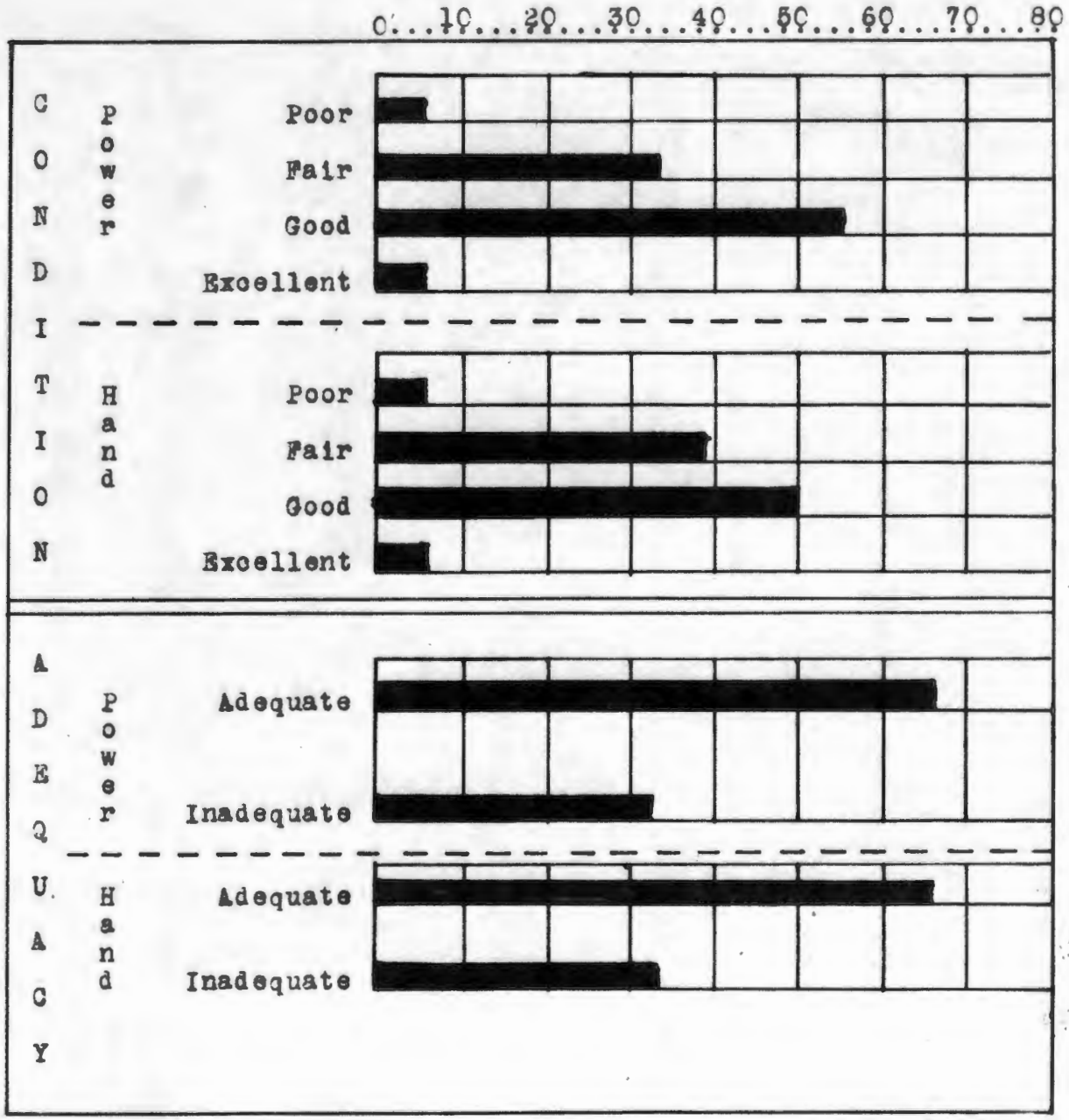

FIGURE 19

CONDITION AND ADEQUACY OF TOOLS

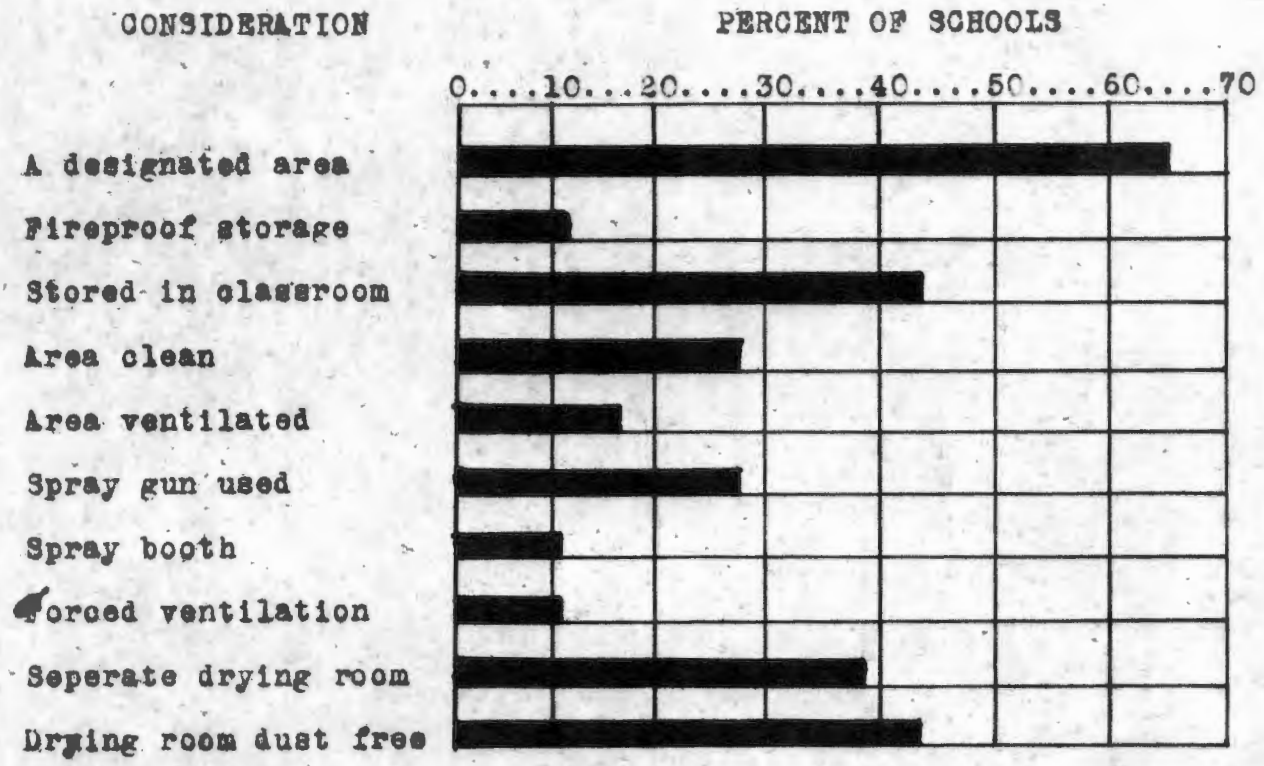

FIGURE 20

PAINTING AND FINISHING FACILITIES

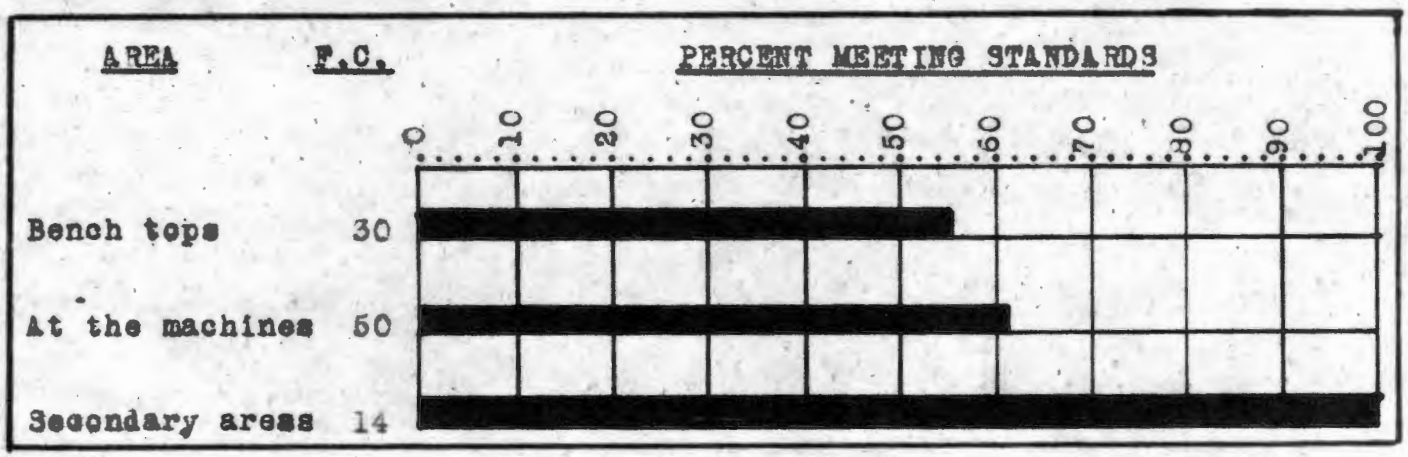

FIGURE 21

LIGHTING ADEQUACY

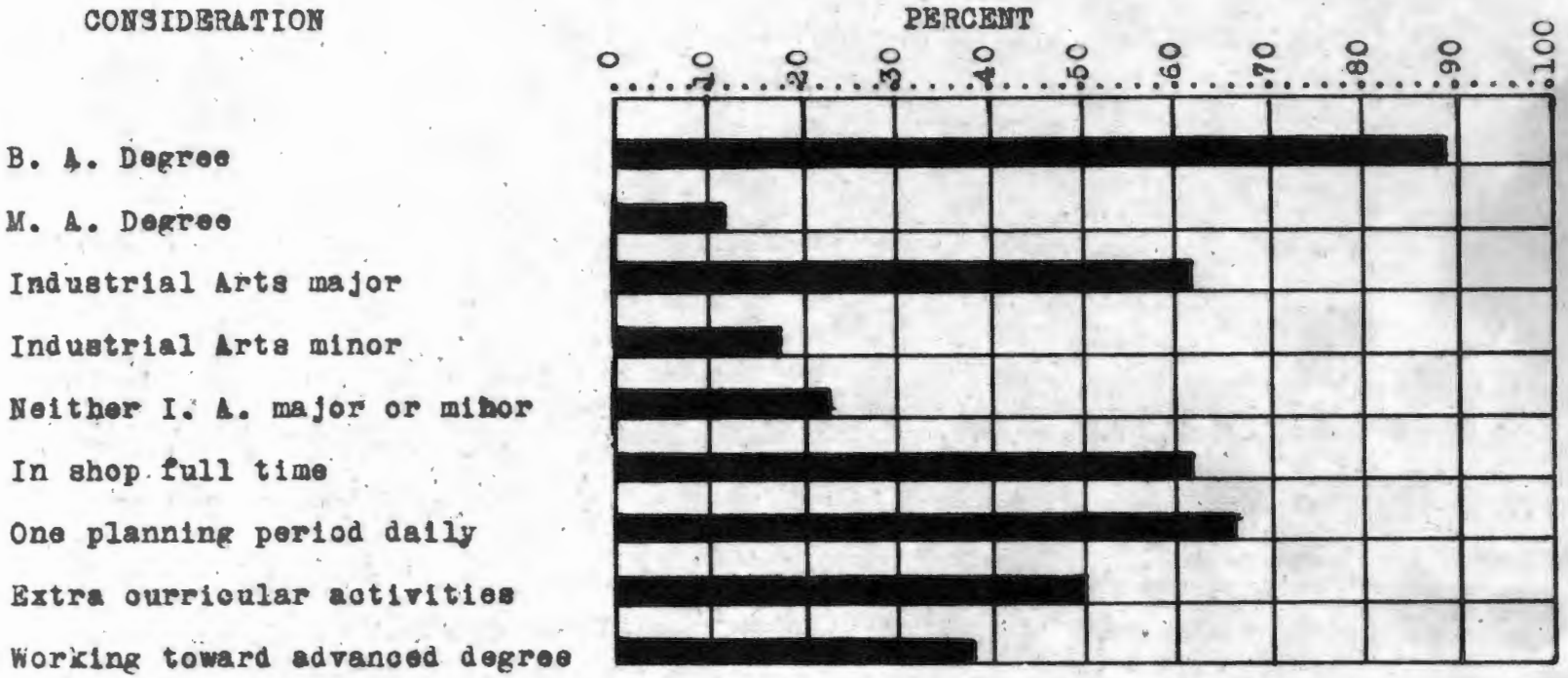

FIGURE 22

INFORMATION ABOUT THE INSTRUCTOR

CHAPTER V

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

The county of Yakima has been shown to be prosperous, with normal communities and inhabited by civic-minded people. Since safety is a universal matter, the question arose as to how well were the people of Yakima county providing for safety in their industrial arts programs.

To bring about a better understanding of industrial arts, its objectives and its position in the school curriculum today, it was necessary to go back to the very early foundations of public training in manipulative skills.

The idea that public schools should be a place to learn things other than the subjects included under formal education was founded by early writers and educators who were aware of the importance of the enthusiasm for individual liberty and emotional participation in life. The Russians were instrumental in adequately analyzing these early theories and developing a system of mechanical arts which was the forerunner of manual training.

Other countries were fast to pick up the new and practical type of education and training. In 1876 groups from all parts of the world exhibited their progress in industrial arts at the Exposition in Philadelphia. The value of manual training was soon recognized in mechanics classes

and began to be taught without any trade motives.

Both aspects of industrial arts developed fast. The vocational movement was supported by private business and large industries. This movement was opposed by labor and school men in general who believed industrial arts should be a part of general education. This split still exists; however, there is room for both theories to exist harmoniously in our public schools today.

The increased interest in manipulative and creative skills as part of general education has spread from the early name of manual training which was basically woodworking up to the more inclusive term industrial arts which may include orientating everyone, especially in regard to the pertinent aspects of production, consumption and recreation.[1]

Out of the expanded scope of industrial arts there has grown three distinct types of shops. The unit shop concentrates on one trade division of an industry. The unit general shop presents one complete area of industry. The general shop presents broad training in the basic industries. Each type has its merits.

Regardless of purpose or educational objectives all shops should be as safe as possible to work in and teachers have a direct responsibility to maintain a safe shop. The

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[1] Wilber, Ibid., p. vii.

tax payers, the school administrators and the teachers also have the responsibility to see that the students develop a wholesome attitude toward safety in order that it may carry over into their post school lives.

To ascertain the safety conditions of the industrial arts shops in the county of Yakima a survey was composed. Due to the nature of the questions and the detail involved the survey was filled out by the writer except when an opinion was arrived at jointly by the writer and the shop teacher involved. The survey was limited to wood shops, since they are the most prevalent in this county.

Upon completion of the survey, answers were tabulated, averages and specific conditions determined. Much of the results must be considered singularly. However, many questions came under one general heading. In such cases the results were stated and charts or graphs were made to facilitate understanding.

CONCLUSIONS

It is concluded that the county of Yakima has several schools where the shops fall far below the recommended minimum standards. Some of these conditions are the result of changing standards. New school buildings are being built with modern shops in many of the county's communities which meet the minimums 100 per cent structurally but still fall

around 50 per cent when considering equipment used.

A new shop in Yakima county should rate very close to 100 per cent on the survey used. If it doesn't, the blame may rest in three groups. First, the taxpayers recognized the need for a new shop and bought the plans as drawn by a competent architect that included all the specifications to construct a safe shop. Then the contractor built the shop and it was still 100 per cent safe; but the taxpayers could not afford or did not think it necessary to buy any new equipment or to bring present equipment up to standard, thus causing the drop in the safety rating.

The second group is the administrators who are caught in the crossfire of doing what they know is right, balancing the budget and pleasing patrons. Most administrators are sympathetic toward low shop standards but are not impressed to the extent of actually appropriating money or time to bring up the standards, especially if the areas in which the shop are low are not apt to produce accidents or injury for which the district may be liable. Another act administrators are often guilty of is taking advantage of the diverse abilities of most shop men and with the result they put him onto too many jobs not related to his shop. Shops require considerable maintainance and apparently very few administrators provide any time consideration for this.

The third responsible group is the teachers themselves. There are numerous reasons a teacher will teach in an unsafe shop even though it is within his power and scope to change the condition. He may not agree with authors and authorities that a particular situation is unsafe. It may be that he realizes the danger but since it has not caused any apparent disturbance, he has done nothing about it. Or it may be that the teacher has so many outside interests that he doesn't want to stay around very long after the last period and therefore doesn't have time to keep his shop up much above 50 per cent. Also, there are numerous men teaching shop with low qualifications, as is indicated by the survey, and they may not be aware of the unsafe conditions.

RECOMMENDATIONS

It is recommended that all who are in a position to foster better safety standards within our school shops set aside some time periodically, shake off the pressures and demands on their time and go into the school shops to make some alert, critical but sincere observations; analyze the shops from every possible approach, bearing in mind all the ramifications of the inclusive term safety, note the discrepancies and substandard conditions that exist and above all, take these conditions, one by one or collectively, and start to really do something about them.

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APPENDIX

QUESTION	SCHOOLS A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	KEY
GRADE LEVEL OF CLASSES	9-12	9-10	7-9	9-12	8-12	7-12	7-12	7-9	9-12	9-12	9-12	7-8	9-12	9-12	8-12	9-12	7-9	7-9	
CLASS SIZE* 1	20	15	30	20	15	15	23	24	27	17	20	28	29	20	23	25	27	29	
UNIT SHOP (U)-GENERAL(G)*	U	U	U	U	U	U	UG	UG	U	U	U	U	U	U	U	U	U	U	
NUMBER OF INSTRUCTORS USING SHOP* 2	1	2	3	1	1	2	2	2	2	3	1	1	2	2	2	3	2	2	
POWER TOOLS* 3																			
Saw	BG	BG		NG	BG	BG			NG	NG					NG	NG		NG	BG - BELT GUARD
Wood lathe											NG	NG							NG - NO GUARD
Sander-disk							ING	IBG		2BG						1	1	1	RG - REAR GUARD
Sander-stationary or belt	1	1		2	1	1	1			2	1		2	1	2	3	1	1	
Emery grinders	1	ING	1	1		1	1		1	ING	ING	1	1	1	1	1	1	1	
Jigsaw	IBG	1		1		1	2		IBG	ING	ING		1	NG	2	IBG	1	1	
Bandsaw			1	1	IBG	1	2		1	2	1	1	1	ING	1	2NG	1	1	
Sandstone													1				1		
Jointer		IB/R	IRG	1	IB/R	1	1		1	ING	1	1	1	IRG	1	2	1	1	
Surfacer							1						1			1			
Router(portable)		1		1	1		1				1		1		1	2	1		
Router(stationary)						1	1		1				1		1	1		1	
Hand drill (electric)							1				1		1	1	1	1			
Drill press							1		1	1		1	1	2	2	3	1	1	
Lap saw unit							1		1			1				1			
NUMBER OF ASSIGNED WORK STATIONS	10	13	10	16	6	24	30	24	28	13	10	20	24	11	26	22	30	30	
NUMBER OF UNASSIGNED WK. STATIONS	8	7	9	11	3	7	13	0	12	0	12	9	15	7	15	33	12	18	
TOTAL NUMBER WORK STATIONS* 4	18	20	19	27	9	53	43	24	40	13	22	29	39	18	41	55	42	48	St - STEAM
AIR CONDITIONS: TYPE OF HEATING	St	St	St	HWB	HWB	St	BL	BL	BL	BL	St	POT BELLY	BL	OIL STOVE	St	BL	St	Rad	BL - BLOWER
Type of ventilation	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	HWB - HOT WATER
Type exhausts used* 5	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	FAN	BLOWER
SOUND: Height of ceiling	14	11.5	7	9	12.5	10	16	9	12	10	14	13	15	14	10	14	15	15	
Type of ceiling	WOOD	FIBRE	FIBRE	FIBRE	WOOD	PLA.	WOOD	FIBRE	WOOD	FB	WOOD	FB	CEM	PLA	FIBRE	WOOD	CEM	WOOD	FB - FIBRE BOARD
Type of walls	CB	PLA	C	C	C/BI	C	C	Br	Br	Ply	T&G	T&G	C	PLA	C	Br	Br	WOOD	CB - CEMENT BLOCK
TOOLS: Condition-Power	3	2	3	2	1	3	4	3	3	2	2	2	3	2	3	3	3	3	C - CEMENT
Condition-hand	3	1	2	2	2	2	4	2	3	2	2	3	3	3	3	3	3	3	Br - BRICK
Adequate number-power* 6	N	Y	N	N	N	Y	Y	Y	N	Y	N	Y	Y	Y	Y	Y	Y	Y	T-G - TONGUE & GROVE
Adequate number-hand* 7	Y	N	N	N	N	N	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	PLA - PLASTER
PAINT AND FINISHING FACILITIES* 8	Y	Y	Y	Y	Y	N	Y	N	Y	Y	N	N	Y	N	Y	Y	N	Y	
Fireproof storage	N	N	N	N	N	N	Y	N	N	N	N	N	N	N	N	Y	N	N	
Stored in classroom	N	Y	Y	N	N	Y	N	Y	N	N	Y	Y	N	N	N	N	Y	Y	
Painting area clean	N	N	N	N	N	N	N	N	Y	N	N	Y	N	Y	N	Y	N	Y	
Area ventilated	N	N	N	N	N	N	Y	N	N	N	N	N	N	N	Y	Y	N	N	
Spray gun used	Y	N	N	N	N	N	N	N	N	Y	N	N	Y	N	Y	Y	N	N	
Adequate exhausts	Y	N	N	N	N	N	Y	N	N	N	N	N	N	N	N	Y	N	N	
Seperate drying room	N	N	Y	N	N	N	N	N	N	Y	N	Y	Y	N	Y	Y	N	N	
Drying room dust free	N	N	Y	Y	Y	N	Y	N	N	N	N	N	Y	N	Y	Y	N	Y	
BENCHES AND VICES: No. of benches	5	5	6	8	4	4	6	4	5 Tables	13	5	10	6	5	12	11	15	15	
Working stations per bench	2	2	2	2	1	6	4	6	1/2	1	2	2	4	2	2	2	2	2	
Size of bench	43X70	43X54	36X66	42X60	33X7'	3'X11'	5'X40	38X48	4'X1' 4'2"X8'	27X68	31X7'	34X72	40X70	44X56	63X47	49X60	5'X3'	3'X3'	
Space between benches	3'	3X4	30X40	32X46	4'	6'	3'	4'	5X3	3X2.5	2X3	4X3	4X4	5X5	3	4	2X3	4X5	
Condition of benches	3	2	1	2	3	2	4	1	3	1	2	2	3	0	3	2	0	2	
Condition of vices	2	1	1	3	3	3	4	2	3	1	1	2	3	1	2	3	2	2	
Type vice-continuous thread		C	C				C	C	C			C		C					
-quick acting	C	C	C	C	C	C	C			C	C		C	C	C	C	C	C	
FLOOR: General conditions	3	3	3	3	3	3	4	1	3	2	3	1	3	0	2	3	3	3	
Material	C	W	C	W	C	T	C	W	C	W	C	W	C	W	W	C	W	C	C - CEMENT
Slippery* 9	N	Y	N	Y	N	Y	N	N	Y	Y	Y	Y	Y	Y	N	N	Y	N	W - WOOD
Finish		Var		Var								Var					Var		T - TILE
FLOOR AREA: Gross interior* 10	1141	1152	1050	2358	1120	1580	3040	1650	1320	2880	972	1728	3300	2000	3726	4170	3570	4262	
Active sq. ft.* 16	719	1008	1050	1875	1120	1398	3040	924	1230	2196	888	1248	2820	1400	3475	2377	1500	2991	
Inactive sq. ft.	196	72				192		726	90	684	84	240	480	600	175	261		411	
Safety zoning used	N	N	N	Y	N	N	N	N	N	N	Y	Y	N	N	N	N	Y	Y	
Safety zoning total sq. ft.				231							194	192					460	534	
Total sq. ft. in main room	945	1080	1050	1875	1120	1580	3040	1650	1320	2880	972	1488	3760	2000	3300	2640	1920	3402	
LIGHTING: Adequate-Bench tops* 12	N	Y	N	N	Y	N	Y	Y	N	Y	Y	N	Y	N	Y	Y	N	Y	
Machines* 13	N	Y	N	Y	Y	N	Y	Y	Y	Y	Y	N	Y	N	N	Y	N	Y	
Secondary areas* 14	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	
Storage areas	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	
Type of fixture	FB-R	FB-R	Clear	C'lear	FB-R	F10	F8-R	FB	FB	FB	FB-R	FB	F10	Clear	FB	F10	FB	F10	FB-R FLOATED BULB & REFLECTOR
Space between fixtures	15'	10X12	8X10	12X12	14	7X6	12	9	10X7	9X12	10	12	10X12	16	14	8X10	14	8X10	
Height from floor	11	11	7	8	10	9	16	7	12	10	14	10	14	14	10	10	10	13	F10 - FLORESCENT
WINDOW AREA: In main room* 15	12	192	13	100	162	121	560	157	252	283	345	136	937	405	240	345	247	759	
Distance up from bottom	46"	3'	4'	5'	56"	5'	5'	6'	41"	40"	4½'	7'	42"	3'	5'	4½'	4'	3'	
Distance down from top	46"	1	1½	0	1'	1'	3'	2'	1'	1'	2'	2'	6"	1'	6"	2'	3'	5'	
Space between windows	10'	14"	15"	30"	3'	21'	0	3'	18"	5'	0	12'	28"	1"	10'	2'	0	0	
TOILETS: Distance from shop* 16	0	180'	180'	100'	150'	25'	0	N	N	0	200'	N	10'	N	50'	0	75'	0	
Number of stools	2	6	5	5	5	3	1			1	5		6		4	1	3	1	
Number of urinals	2	3	3	6	4	2	1			0	9		3		2	2	3	1	

Washing facilities with soap	Y	Y	Y	Y	Y	Y	Y	N	N	Y	Y	N		Y	Y	C		Y	
LOCKERS: Adequate* 17	N	N	N	N	N	N	N	Y	Y	N	Y	N	Y	N	Y	Y	N	N	
Pupils per locker								2	2		2		2		2	2			
STORAGE: Space* 18	Good	9x15		12x40		6x12	12x15	14x30	14x20	12x22		9x6	10x30	6x12	30x9	9x28	7x8	7x21	
Unassembled projects(adequate)	N	Y	N	N	N	N	N	N	N	N	N	N	Y	N	Y	Y	Y	Y	
Assembled projects (adequate)	N	N	N	N	N	N	Y	Y	Y	N	N	N	Y	N	Y	Y	Y	Y	
DISPLAY OF WORK AND PROJECTS* 19	Y	N	N	N	N	N	Y	N	N	N	Y	N	N	N	N	N	Y	N	
BULLETIN BOARD* 20	Y	Y	N	Y	N	N	N	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	
AUDIO VISUAL AIDS USED(No. per yr)			3	5	3		10			3		6	5		3	6	6	6	
Where shown			SHOP	SHOP	SHOP		SHOP			Class		Class	SHOP		SHOP	Class	Cafe	SHOP	
FIRST AID KIT* 21	F	P	F	P		F	F		F	F	F	G	G		G	G	G		
Administered by whom	T	T-P	P	T-P			T		T-P	T-P		T			T-P	T-P	T		TEACHER - T
Availability of Doctor	10	30	15	3		5	5		15	30		10		15	2	10	10	3	PUPIL - P
Red Cross First Aid cert.	N	N	N	Y	Y	Y	Y	N	N	N	N	N	Y	N	N	N	Y	N	
LENGTH OF CLASS PERIOD	55	60	50	50	57	55	50	55	55	60	55	40	54	55	57	55	55	55	
Minutes used to clean up	5	5	5	8	10	10	10	7	8	10	6	7	7	7	5	7	7	6	
Organized shop personnel	Y	Y	Y	Y	N	N	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	
JANITOR SERVICE* 22	Y	Y	Y	N	N	N	Y	N	N	N	N	N	N	N	N	N	N	N	
ACCIDENT REPORT FORM-Kept in shop?	N	N	N	N	N	N	N	N	N	N	N	N	N	N	Y	N	N	N	
Used on all accidents	N	N	N	N	N	N	Y	N	N	N	N	N	N	N	X	N	N	N	
Used only if Doctor required	Y	Y	Y	Y	Y	Y		Y	Y	Y	Y	Y	Y	Y		Y	Y	Y	
Electricity - Volts	110	110 220	110 220	110 220	110 220	110	110 220	110 220	110	110	110 220	110 220	110 220	110 220	110 220	110 220	110 220	110 220	
Number of outlets	7	5	7	9	4/2	8	9/17	11/3	4	14	6/4	2/2	9/5	8/2	8/8	11/19	6/9	10/7	
Kind of outlets	DW	DW	DW	DF	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	C	DW	F	DW - DOUBLE WALL
Machines grounded* 23	N	N	N	N	N	N	Y	N	N	N	N	N	N	Y	N	Y	Y	N	DF - DOUBLE FLOOR
Fuse box locked	N	N	N	Y	N	N	Y	N	N	N	N	N	Y	N	N	N	Y	Y	C - CEILING
FIRE: Alarm system adequate* 24	Y	Y	Y	Y	N	Y	Y	Y	Y	N	Y	Y	N	Y	Y	N	N	Y	F - FLOOR
Number of extinguishers	5	1		2			1	2	1	2	1	1	1	3	5	1	1	2	
Type of extinguishers	All	CO_2		CO_2			CO_2	CT	CT	CO_2	CO_2	FOAM	FOAM	CT	All	CT	FOAM	CO_2	
Periodically checked	Y	Y	N	Y	N	N	Y	Y	Y	Y	Y	N	Y	Y	N	Y	Y	Y	
Fire drills held regularly	Y	N	Y	Y	N	Y	Y	Y	Y	Y	Y	N	N	Y	Y	Y	Y	Y	
Pupils trained to fight fire	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	
TEACHER: Name																			
Degree held	BA	BA	BA	BS	BA	BS	MA	BA	BS	BS	BA	BA	BA	BA	BS	MA	BA	BS	
Institution	CPS	CWCE	EWC	WSC	CWCE	WSC	Greeley	WSC	WSC	WSC	CWCE	CWCE	WSC	UW	WSC	Greeley	CWCE	CWCE	
In shop full time	N	N	N	Y	N	N	Y	N	N	N	Y	N	Y	N	Y	Y	Y	Y	
Number of years shop teacher	1	1	1	8	1	1	8	6	3	6	1	0	6	0	11	1	2	14	
Other subjects currently Teach.	SP ENG	Block	CORE	N	MATH	MATH	N	N	N	N	Ag	N	Block	N	N	N	N	N	
Daily planning period	Y	Y	N	Y	N	N	N	Y	Y	Y	Y	Y	Y	N	N	Y	Y	Y	
Extra curricular activities	N	Y	N	N	N	Y	Y	Y	N	Y	N	N	N	Y	N	Y	Y	N	
Major/minor* 25	SP ENG	EA REC	IA MATH	PE IA	IA PE	PE MST	PE IA	IA SCI	IA PE	PE GAME	IA REC	IA SP	IA SCI	ENG IA	SCI SCI	IA PE	IA MATH	EA BUS	
Does own maintainance	N	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	
Shop empty for maintainance	Y	Y	Y	N	Y	N	N	N	Y	Y	Y	Y	Y	Y	N	N	N	N	
Working toward advance degree	N	Y	N	N	N	Y	Y	N	Y	N	Y	N	N	Y	N	N	Y	N	

QUESTION	SCHOOLS A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	KEY
GRADE LEVEL OF CLASSES	9-12	9-10	7-9	9-12	8-12	7-12	7-12	7-9	9-12	9-12	9-12	7-8	9-12	9-12	9-12	9-12	7-9	7-9	
CLASS SIZE* 1	20	15	30	20	15	15	23	24	27	17	20	28	29	20	23	25	27	29	
UNIT SHOP (U)-GENERAL(G) *	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	
NUMBER OF INSTRUCTORS USING SHOP* 2	1	2	3	1	1	2	2	2	2	3	1	1	2	2	2	3	2	2	
POWER TOOLS* 3																			
Saw	BG	BG		NG	BG	BG			NG	NG					NG	NG		NG	BG - BELT GUARD
Wood lathe											NG	NG		NG					NG - NO GUARD
Sander-disk							ING	IBG		2BG						1	1	1	RG - REAR GUARD
Sander-stationary or belt	1	1		2	1	1	1			2	1		2	1	3	3	1	1	
Emery grinders	1	ING	1	1		1	1		1	ING	ING	1	1	1	1	1	1	1	
Jigsaw	IBG	1		1		1	2		IBG	ING	ING		1	NG	2	IBG	1	1	
Bandsaw			1	1	IBG	1	2		1	2	1	1	1	ING	1	2NG	1	1	
Sandstone													1				1		
Jointer		IB/R	IRG	1	IB/R	1	1		1	ING	1	1	1	IRG	1	2	1	1	
Surfacer							1						1			1			
Router(portable)		1		1	1		1				1		1		1	2	1		
Router(stationary)						1	1		1				1		1	1		1	
Hand drill (electric)							1				1		1	1	1	1			
Drill press							1		1	1		1	1	2	2	3	1	1	
Lap saw unit							1		1			1				1			
NUMBER OF ASSIGNED WORK STATIONS	10	13	10	16	6	24	30	24	25	13	10	20	24	11	26	22	30	30	
NUMBER OF UNASSIGNED WK. STATIONS	9	7	9	11	3	7	13	0	12	0	12	9	15	7	18	53	13	18	
TOTAL NUMBER WORK STATIONS* 4	19	20	19	27	9	31	43	24	40	13	22	29	39	18	44	75	43	48	ST - STEAM
AIR CONDITIONS: TYPE OF HEATING	ST	ST	ST	HWB	HWB	ST	BL	BL	BL	BL	ST	BL	BL	BL STOVE	ST	BL	ST		BL - BLOWER
Type of ventilation	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	HWB - HOT WATER BLOWER
Type exhausts used* 5	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	FAN	
SOUND: Heigth of ceiling	14	11.5	7	9	12.5	10	16	9	12	10	14	13	15	14	10	14	15	15	
Type of ceiling	WOOD	FIBRE	FIBRE	FIBRE	WOOD	PLA.	WOOD	FIBRE	WOOD	FB	WOOD	FB	CEM	PLA.	FIBRE	WOOD	CEM	WOOD	FB - FIBRE BOARD
Type of walls	CB	PLA	C	C	C.BL	C	C	Br	Br	Ply	T&G	T&G	C	PLA	C	Br	Br	WOOD	CB - CEMENT BLOCK
TOOLS: Condition-Power	3	2	3	2	1	3	4	3	3	2	2	2	3	2	3	3	3	3	C - CEMENT
Condition-hand	3	1	2	2	2	2	4	2	3	2	2	3	3	3	3	3	3	3	Br - BRICK
Adequate number-power* 6	N	Y	N	N	N	Y	Y	Y	N	Y	N	Y	Y	Y	Y	Y	Y	Y	T-G - TONGUE & GROVE
Adequate number-hand* 7	Y	N	N	N	N	N	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	PLA - PLASTER
PAINT AND FINISHING FACILITIES* 8	Y	Y	Y	Y	Y	N	Y	N	Y	Y	N	N	Y	N	Y	Y	N	Y	
Fireproof storage	N	N	N	N	N	N	Y	N	N	N	N	N	N	N	N	Y	N	N	
Stored in classroom	N	Y	Y	N	N	Y	N	Y	N	N	Y	Y	N	N	N	N	Y	Y	
Painting area clean	N	N	N	N	N	N	N	N	Y	N	N	Y	N	Y	N	Y	N	Y	
Area ventilated	N	N	N	N	N	N	Y	N	N	N	N	N	N	N	Y	Y	N	N	
Spray gun used	Y	N	N	N	N	N	N	N	N	Y	N	N	Y	N	Y	Y	N	N	
Adequate exhausts	Y	N	N	N	N	N	Y	N	N	N	N	N	N	N	N	Y	N	N	
Seperate drying room	N	N	Y	N	N	N	N	N	N	Y	N	Y	Y	N	Y	Y	N	N	
Drying room dust free	N	N	Y	Y	Y	N	Y	N	N	N	N	N	Y	N	Y	Y	N	Y	
BENCHES AND VICES: No. of benches	5	5	6	8	4	4	6	4	5 1/2 M	13	5	10	6	5	12	11	15	15	
Working stations per bench	2	2	2	2	1	6	4	6	6/2	1	2	2	4	2	2	2	2	2	
Size of bench	43X70	43X54	36X66	42X60	33X7'	3'X11'	57X40	38X48	4X11' 4X8'	27X98	31X7'	34X72	40X70	44X60	63X47	69X60	5'X3'	3'X6'	
Space between benches	3'	3X4	30X40	30X46	4'	6'	3'	4'	5X3	3'2.5"	3X3	4X3	4X4	5'5"	3	4	2X3	4X5	
Condition of benches	3	2	1	2	3	2	4	1	3	1	2	2	3	0	3	2	0	2	
Condition of vices	2	1	1	3	3	3	4	2	3	1	1	2	3	1	2	3	2	2	
Type vice-continuous thread		C	C				C	C	C			C							
-quick acting	Q	Q	Q	Q	Q	Q	Q			Q	Q		Q	Q	Q	Q	Q	Q	
FLOOR: General conditions	3	3	3	3	3	3	4	1	3	2	3	1	3	0	2	3	3	3	
Material	C	W	C	W	C	T	C	W	C	W	C	W	C	W	W	C	W	C	C - CEMENT
Slippery* 9	N	Y	N	Y	N	Y	N	N	Y	Y	Y	Y	Y	Y	N	N	N	N	W - WOOD
Finish		Var		Var								Var					Var		T - TILE
FLOOR AREA: Gross interior* 10	1141	1152	1050	2358	1120	1580	3040	1650	1320	2880	972	1728	3900	2000	3986	4170	1570	4202	
Active sq. ft.* 11	749	1008	1050	1875	1120	1398	3040	924	1230	2196	888	1248	3020	1400	3175	2379	1500	2891	
Inactive sq. ft.	196	72				192		726	90	684	84	240	740	600	175	261		411	
Safety zoning used	N	N	N	Y	N	N	N	N	N	N	Y	Y	N	N	N	N	Y	Y	
Safety zoning total sq. ft.				231							194	192					460	534	
Total sq. ft. in main room	945	1080	1050	1875	1120	1580	3040	1650	1320	2880	972	1488	3760	2000	3350	2640	1320	3402	
LIGHTING: Adequate-Bench tops* 12	N	Y	N	N	Y	N	Y	Y	N	Y	Y	N	Y	N	Y	Y	N	Y	
Machines* 13	N	Y	N	Y	Y	N	Y	Y	Y	Y	Y	N	Y	N	N	Y	N	Y	
Secondary areas* 14	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	
Storage areas	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	
Type of fixture	FB-R	FB-R	Clear	Clear	FB-R	F10	FB-R	FB	FB	FB	FB-R	FB	F10	Clear	FB	F10	FB	F10	FB-R FROSTED TUBE & REFLECTOR
Space between fixtures	15"	10X12	8X10	12X12	14	7X6	12	9	10X7	9X12	10	12	10X12	16	14	8X10	14	8X10	
Heigth from floor	11	11	7	8	10	9	16	7	12	10	14	10	14	14	10	10	10	13	F10 - FLORESCENT
WINDOW AREA: In main room* 15	312	192	13	100	162	121	560	157	252	288	345	136	937	405	240	245	247	709	
Distance up from bottom	46"	3'	4'	5'	56"	5'	5'	6'	41"	40"	4 1/2'	7'	42"	3'	5'	4 1/2'	4'	5'	
Distance down from top	46"	1	1 1/2"	0	1'	1'	3'	2'	1'	1'	2'	2'	6"	1'	6"	2'	3'	5'	
Space between windows	10'	14"	15"	30"	3'	21'	0	3'	18"	5"	0	12'	28"	1"	10'	2'	0	0	
TOILETS: Distance from shop* 16	0	180'	180'	100'	150'	25'	0	N	N	0	200'	N	10'	N	50'	0	75'	0	

Number of urinals	2	3	3	6	4	2	1			0	9		3		2	2	3	1		
Washing facilities with soap	Y	Y	Y	Y	Y	Y	Y	N	N	Y	Y	N	Y	Y	Y	Y	Y	Y		
LOCKERS: Adequate* 17	N	N	N	N	N	N	N	Y	Y	N	Y	N	Y	N	Y	Y	N	N		
Pupils per locker								2	2		2		2		2	2				
STORAGE: Stock* 18	6x20	9x15		12x40		6x12	12x15	14x30	14x30	12x22		8x6	10x30	6x12	30x3	9x28	7x8	7x21		
Unassembled projects(adequate)	N	N	N	N	N	N	N	N	N	N	N	N	Y	N	Y	Y	Y	Y		
Assembled projects (adequate)	N	N	N	N	N	N	Y	Y	Y	N	N	N	Y	N	Y	Y	Y	Y		
DISPLAY OF WORK AND PROJECTS* 19	Y	N	N	N	N	N	Y	N	N	N	Y	N	N	N	N	N	Y	N		
BULLETIN BOARD* 20	Y	Y	N	Y	N	N	N	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	Y		
AUDIO VISUAL AIDS USED(No. per yr)			3	5	3		10			3		6	5		3	6	6	6		
Where shown			SHOP	SHOP	SHOP		SHOP			Class		Class	SHOP		SHOP	Class	Cafe	SHOP		
FIRST AID KIT* 21	F	P	F	P		F	F		F	F	F	G	G		G	G	G			
Administered by whom	T	T-P	P	T-P			T		T-P	T-P		T			T-P	T-P	T		TEACHER - T	
Availability of Doctor	10	20	15	3		5	5		15	20		10		15	2	10	10	3	PUPIL - P	
Red Cross first Aid cert.	N	N	N	Y	Y	Y	Y	N	N	N	N	N	Y	N	N	N	Y	N		
LENGTH OF CLASS PERIOD	55	60	50	50	57	55	50	55	55	60	55	40	54	55	57	55	55	55		
Minutes used to clean up	5	5	5	8	10	10	10	7	8	10	6	7	7	7	5	7	7	6		
Organized shop personnel	Y	Y	Y	Y	N	N	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	Y		
JANITOR SERVICE* 22	Y	Y	Y	N	N	N	Y	N	N	N	N	N	N	N	N	N	N	N		
ACCIDENT REPORT FORM-Kept in shop?	N	N	N	N	N	N	N	N	N	N	N	N	N	N	Y	N	N	N		
Used on all accidents	N	N	N	N	N	N	Y	N	N	N	N	N	N	N	Y	Y	Y	Y		
Used only if Doctor required	Y	Y	Y	Y	Y	Y		Y	Y	Y		Y	Y	Y						
Electricity - Volts	110	110 220	110 220	110 220	110 220	110	110 220	110 220	110	110	110 220	110 220	110 220	110 220	110 220	110 220	110 220	110 220		
Number of outlets	7	5	7	9	4/2	8	9/17	11/3	4	14	6/4	3/2	9/5	8/2	8/8	11/9	6/9	10/7		
Kind of outlets	DW	DW	DW	DF	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	C	DW	F	DW - DOUBLE WALL	
Machines grounded* 23	N	N	N	N	N	N	Y	N	N	N	N	N	Y	Y	N	Y	Y	N	DF - DOUBLE FLOOR	
Fuse box locked	N	N	N	Y	N	N	Y	N	N	N	N	N	Y	Y	Y	N	N	Y	C - CEILING	
FIRE: Alarm system adequate* 24	Y	Y	Y	Y	N	Y	Y	Y	Y	N	Y	Y	N	Y	Y	N	N	Y	F - FLOOR	
Number of extinguishers	5	1		2			1	2	1	2	1	1	1	3	5	1	1	2		
Type of extinguishers	All	CO_2		CO_2			CO_2	CT	CT	CO_2	CO_2	FOAM	FOAM	CT	Gal	CT	FOAM	CO_2		
Periodically checked	Y	Y	N	Y	N	N	Y	Y	Y	Y	Y	N	Y	Y	N	Y	Y	Y		
Fire drills held regularly	Y	N	Y	Y	N	Y	Y	Y	Y	Y	Y	N	N	Y	Y	Y	Y	Y		
Pupils trained to fight fire	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N		
TEACHER: Name																				
Degree held	BA	BA	BA	BS	BA	BS	MA	BA	BS	BS	BA	BA	BA	BA	BS	MA	BA	BS		
Institution	CPS	CWCE	EWC	WSC	CWCE	WSC	Greely	WSC	WSC	WSC	CWCE	CWCE	WSC	UW	WSC	Greely	CWCE	CWCE		
In shop full time	N	N	N	Y	N	N	Y	N	N	N	Y	N	Y	N	Y	Y	Y	Y		
Number of years shop teacher	11	1	1	8	1	1	8	6	3	6	1	0	6	0	11	1	2	14		
Other subjects currently Teach	SP ENG	BLOCK	CORE	N	MATH	MATH	N	N	N	N	Ag	N	BLOCK	N	Ag	N	N	N		
Daily planning period	Y	Y	N	Y	N	N	N	Y	Y	Y	Y	Y	Y	N	N	Y	Y	Y		
Extra curricular activities	N	Y	N	N	N	Y	Y	Y	N	Y	N	N	N	Y	N	Y	Y	N		
Major/minor* 25	SP ENG	FA ART	IA Math	PE IA	PE IA	PE MUSIC	PE IA	IA SCI	IA PE	AG ENG	IA ENG	IA SP	IA SCI	ENG IA	SCI SCI	IA PE	IA Math	FA BUS		
Does own maintainance	N	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	Y		
Shop empty for maintainance	Y	Y	Y	N	Y	N	N	N	Y	Y	Y	Y	Y	Y	N	N	N	N		
Working toward advance degree	N	Y	N	N	N	Y	Y	N	Y	N	Y	N	N	Y	N	N	Y	N		