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A manual for student-teachers of comprehensive general shops

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A MANUAL FOR STUDENT-TEACHERS OF COMPREHENSIVE GENERAL SHOPS

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CHAPTER I

GENERAL INTRODUCTION TO THE PROBLEM

The information in this manual has been prepared with the thought of consciously directing attention of students and student-teachers in the industrial arts field to certain specific factors which are pertinent to the teaching of this so-called special subject. Some very definite items will be evaluated: methods of teaching, aims and objectives, types of laboratories, standards of achievement, records, environmental factors (health, safety, details of room, equipment and supply management, etc.), the teacher, and other items which contribute toward the conduct of successful learning.

It is a recognized fact that the student in training must make very definite reactions to situations and conditions which he has observed if they are to be of much value to him. Unless he realizes that a definite reaction should be made to situations, his training will necessarily continue at the expense of his school. He must be an individual who comes prepared to accept his responsibility and direct effort in the right directions. Conclusions of procedure based upon observations should be founded upon judgment and experience and not upon personalities, hearsay, and previous opinions.

The student will find that ideal conditions seldom obtain and that excellent results do not follow from them, but there are

ether factors of extreme importance. First among these factors is the teacher standing in the position of leader and adviser. One thing to be learned above all others is that he is expected to realize and it is his duty to achieve the best possible results with the facilities available.

I. THE PROBLEM

Statement of the problem. The trend in recent years has been to organize the industrial arts offerings under a plan known rather generally as a comprehensive general shop. The majority of beginning teachers may well expect their teaching experience in the industrial arts to begin in small communities in which this type of industrial arts offering prevails. The writer's experience has led him to recognize that student-teachers are confronted with a definite need for guidance in several problems connected with the teaching of industrial arts.

It is recognized that there are many areas of experience that could well be offered in the comprehensive general shop. This study is an attempt to deal with the problems connected with some of the areas commonly found in this type of shop.

Importance of the study. Recognition of the need for the guidance of student-teachers of the industrial arts subjects is evident from the amount of piecemeal, unassembled materials already available on various phases of comprehensive general shop teaching problems. There is, therefore, a need for a

compilation of information of value to the student-teacher. This manual is an attempt to meet this need by furnishing some of this requisite information.

Source of the data. Much of the information used in this study has been gathered from many of the finest available textbooks that deal with the teaching problems of industrial arts. A listing of these excellent source books can be found in the bibliography of the study.

Many outstanding current magazine articles have made their contribution to this manual. The Industrial Arts and Vocational Education magazine was found to be a particularly fine source of periodical material. A compilation of these articles can also be found in the bibliography of the study.

Personal discussions with outstanding educators in the field of industrial arts have been especially fruitful in preparing this study. Many of the discussions led to later classroom discussions that brought to light many phases of the subject previously entirely unconsidered.

II. DEFINITION OF THE TERM

The comprehensive general shop. The comprehensive general shop, which houses a number of small related divisions under the direction of one teacher, is widely used and will give a small community with limited funds an opportunity to offer a rich course

in industrial arts.[1] For example, a comprehensive general shop may have instructional divisions in metalwork, woodwork, drawing, home mechanics, model aircraft, and electricity. It may have other divisions in addition to those listed above.

In this type of organization it often happens that one or two divisions will be given special emphasis. We may think of the comprehensive general shop organization as made up of a number of related shops shrunk by the removal of individual pupil equipment until they will all go into one shop. This is the logical way to house a broad non-vocational course with the limited equipment and space afforded by the resources of the type usually found in the small school.

With this method of organization, pupils may be assigned projects in any of the divisions or even projects which involve the doing of work in several related divisions.

III. CRITERIA OF GOOD TEACHING

> "All things being equal, that method is better which will furnish the child that experience which will contribute to his growth in knowledges, skills, habits, attitudes, and purposes, which in their turn will contribute to the welfare of society."[2]

The following statements harmonize with approved practices in sound educational policy. Therefore, they may be

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[1] Louis V. Newkirk and George D. Stoddard, The General Shop (Peoria, Illinois: The Manual Arts Press, 1929), p. 13.

[2] Ruby Minor, Principles of Teaching Practically Applied (Boston: Houghton-Mifflin Company, 1924), p. 30.

considered criteria for good teaching. These criteria were presented by Professor Harold Bright of Indiana State Teachers College in a lecture given in the summer of 1941 to a class studying the supervision of student teaching.

1. Education is guided and directed growth.

2. The pupil's activities are given direction only by some goal which he seeks to attain.

3. Problem-solving is the way of human learning.

4. Persistence in problem-solving behavior varies with the explicitness of the directions which the pupils receive.

5. Learning is most effective when optimally emotionalized.

6. Knowledge of progress is a powerful incentive to effort.

7. All learning involves integration.

8. Application of the learning product is essential if transfer is to take place.

9. Independence in learning is encouraged if the pupil has some choice in what he is to do, how he is to do it, and when he is to do it. (The assignment should show evidence that all pupils, not merely the bright, enjoy as much freedom of action as is consistent with direction and guidance of learning in groups.)

10. Because of the fact of individual differences, pupils should not begin necessarily at the same place, nor proceed at the same rate, in the same direction, and in the same way.

IV. AIMS AND OBJECTIVES OF STUDENT TEACHING

At the fourteenth annual session of the supervisors of student teaching, Charles W. Waddell[3] gave a list of general aims

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[3] Charles W. Waddell, "Supervision of Student Teaching," Supervisors of Student Teaching, 14th Annual Session, 1934.

and objectives of student teaching that are easily adaptable to the problem of the student-teacher of industrial arts. An adaptation of his list of aims and objectives follows:

1. These relating to personal qualities:
   a. To make students thoroughly aware of the effects of personal traits upon teaching ability.
   b. To aid the student to overcome or reduce remediable handicaps.
   c. To develop and cultivate desirable mental and temperamental habits and attitudes.
   d. To establish and strengthen native qualities of leadership and character.

2. Those relating to the student's background of preparation:
   a. To increase professional insight and outlook.
   b. To supply motive and purpose for perfecting professional knowledge and skills.
   c. To habituate the student in the practice of careful, specific, daily preparation.
   d. To promote a growing independence in self help.

3. These relating to the student's managerial ability:
   a. To develop sensitiveness to hygienic, well-regulated workshop atmosphere and the habit of attention to such matters.
   b. To give guided practice in recognition of levels of pupil behavior and in adaptation of methods of control to pupil needs.

4. These relating to skill in teaching:
   a. To give practice in recognition of the type of learning involved in any piece of pupil work.
   b. To give practice in adapting teaching procedures to the learning types involved.
   c. To give practice in directing pupil purposing and planning.
   d. To promote a degree of mastery of the techniques of the types of lesson procedure used in activity teaching.
   e. To habituate students to the maintenance of high standards of work; to the diagnosing of

individual difficulties; to the application of remedial measures; and to the checking of results.

5. Miscellaneous objectives:
   a. To determine fitness for certification and, by trial, the level of work for which the student has greatest aptitudes.
   b. To develop increasing capacity to solve teaching problems on the basis of principles.
   c. To give practice in building large units of work, in breaking down subject-matter barriers, and in teaching in terms of integration of child experience rather than in terms of traditional subjects of study.
   d. To acquaint students with effective methods of the use of activity curricula, books, excursions, and other teaching materials.

CHAPTER II

THE TEACHER

Success in teaching seems to be influenced by and to a large extent dependent upon certain rather intangible qualities or characteristics in the student-teacher. Notable among these are his mental health, physical well-being, philosophy, scholastic preparation, and personality traits, and his conceptions of the relations he has with pupils, parents, supervisors, and the community in general.

Mental health. That emotional stability is a requisite factor in success in teaching is so evident that its importance must not be overlooked. Some considerations which seem to affect success are mental in origin and rather intangible. The student must at all times maintain an open mind on all questions and be willing to consider new ideas. He must be concerned with the development of the whole child rather than the child's attainments in his own limited field of instruction. The student should have definite ideas as to the relative values of work and leisure. He should arrive at a desirable balance between working time and leisure time. The leisure time activities should be in accordance with clean living.

The student-teacher must be congenial, cooperative, and eager to assist in furthering all phases of the school program.

He must not only profess to be willing to help others, but he must evidence that willingness by his actions. In other words, his intentions must be understood.

The student must be able to face life squarely. He is not in a position to make his conditions; he must adjust himself to them. The degree and extent of this adjustment to unalterable situations determine very largely his success in his chosen field.

A teacher is a student; therefore, the student-teacher must not lose sight of the fact that his success depends largely upon continued growth. He must be of an inquiring mind. He must be able to assimilate and make the best of the complex problems of living, both inside and outside of the classroom.

Physical well-being. A physically sick person cannot teach with any very great degree of success. The teacher should at all times strive to maintain a state of physical efficiency. This does not mean that he should be a fadist or a crank, but that he should adhere to, recognize, and accept rules which contribute to his physical well-being.

The educational background of the student should have included very definite instruction in maintaining his physical health, such as: periodic medical examinations, periodic dental examinations, regular exercise to maintain physical fitness, and dietary habits conducive to the maintenance of good health.

Philosophy. Every teacher should have a general philosophy of education and a subject philosophy that integrates with the former. There should be little or no conflict between the two. We cannot teach without a philosophy. Having this, we set up objectives for teaching our subject-matter. Without a philosophy, it would be difficult to know what to teach or how to select a curriculum. With a philosophy, it is easy to justify the methods of teaching or the course of study used.

The teacher should have a broad general background of information and experience as well as know the individual field to be taught. He should know child psychology. He should be familiar with the learning process and practice its principles. His educational philosophy should stimulate him to think. The teacher's philosophy will be personal. It will change as the person "grows" and changes. Change can be for good or bad. The teacher should keep in step with the changing world.

In formulating a teaching philosophy one should consider the following: the growth of the individual; educational adjustment; ability to use habits, skills, data; transfer of training; open-mindedness; individual differences; child or student interests; self-directed activity; self-expression; the child-centered school; influence of a definite progress of effort; democracy; and the limitations of the schools in education. The teacher of industrial arts must believe in the

philosophy of learning by doing. The following purpose of a philosophy of education is enlightening:

> A philosophy of education is not something which stands apart in the experience of the individual. If it is significant at all, it must give meaning to methods of teaching and of learning; it must make its contribution to the understanding and development of character; it must furnish criteria for the judgment of social progress; and it must throw light upon the current scene, whether national or international.[4]

The educational creed of the late Francis Marion Stalker is, for all practical purposes, a fine working philosophy for all teachers of industrial arts and other subjects:

> To have and to keep a sane healthy soul in a sound healthy body; to think straight, to appreciate beauty in nature, in the fine arts, and in the deeds of men; to act nobly; to work skillfully with the hands as well as with the head; to realize that there is work to be done in the world; above all, to be consumed with a burning desire to do a full share of the world's work -- these are the marks of a completely educated man or woman.[5]

Sufficient understanding of the philosophy of education to enable the student to have some appreciation of the aims of the school in general -- to have a clear conception of the relation of industrial arts to the other subjects of the curriculum is desirable.[6]

Educational preparation. The best teachers for the general shop are not tradesmen -- master craftsmen in a specific

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[4] Michael Demiashkevich, An Introduction to the Philosophy of Education (New York: American Book Company, 1935), p. 181.

[5] Francis M. Stalker, "My Educational Creed," (from a plaque in Stalker Hall of Indiana State Teachers College, 1940)

[6] Newkirk and Steddard, op. cit., p. 186.

trade -- but men of wide technical training who know how to collect, assemble, and organize available materials and present them to the class in a clear and forceful manner. It is not possible to become thoroughly proficient in more than one, or two at the most, of the large number of mechanical trades.

The student-teacher should have as intensive and extensive a technical training as seems practical in the time that is usually allotted to the completion of undergraduate preparation -- four years. His fundamental technical training should include beginning courses in drawing, design, woodworking, finishing, electrical work, sheet-metal working, printing, bench-metal working, machine-shop practice, foundry, etc.

Since the general shop teacher is closer to the occupational life of the students than most other teachers, he should be instructed in various occupational requirements, employment trends, and factors influencing success in these occupations. He should be able to offer a course which will present opportunities for exploration and guidance.

Personality. The most important single force at the disposal of the school for the upbuilding of character is undoubtedly the character of the teacher. Habits of conduct are quite contagious.[7] The student-teacher must avoid the common

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[7] Frank C. Sharp, Education for Character (Indianapolis, Indiana: The Bobbs-Merrill Company, 1927), p. 9.

error of assuming that vague terms such as "personality," "natural aptitude," and "common-sense" are potent spells to charm away all the difficulties of the school-room and atone for all the deficiencies due to ignorance and lack of professional training. They can never serve as a substitute for scholarship, professional knowledge, experience, and hard work. The personality of a man is the sum total of what he is, and varies as greatly as people vary. There is such a thing as aptitude for teaching, but one must judge for himself how much of it is natural and how much of it is the result of study and hard work.

The personality of an individual is not a fixed quantity; it varies with his experience and grows with his growth. It has strong points and weak points. It is partly good and partly bad. If personality is the cause of success, it is also the cause of failure. The strongest factor of all in shaping this growing personality, in strengthening the weak places and in overcoming the bad, is individual effort. The personality of a man is not what he thinks himself to be, not what other people think him to be, but what he really is. This real self is the sum total of all the influences that have consciously or unconsciously entered his life, all the subtle influences of race, heredity, and ancestry, all the potent factors of early environment in home, church, and neighborhood, all the thoughts of his past, all the emotions of his heart, all the decisions of his will, all the lessons he has learned, all the deeds he has done. All these added together are his personality.

Relations with supervisor. The student-teacher is generally responsible in some measure to one or more supervisory officers. The measure of this responsibility is usually large and is usually centered in one official variously known as the critic-teacher, the supervising-teacher, the laboratory supervisor, etc. For most purposes the term critic-teacher is used to refer to this official.

The fundamental purpose of supervision, whether of schools or of other activities, is to effect increased efficiency of all who participate therein. One of the functions of the critic-teacher is to offer constructive criticism. It is often difficult for student-teachers to appreciate the purpose of such criticism, or to avail themselves of the aid which is offered in this form. Criticism has not fulfilled its mission, if it stops with uncovering the teacher's strengths and weaknesses. It must also include an analysis of teaching situations which will enable the student-teacher to repeat successes and avoid failures. A wide-awake teacher will be searching and asking for suggestions pertinent to improving his teaching. Constructive criticism opens up the way for growth by giving the teacher the encouragement and help which are needed to undertake the new or unusual type of work. Many of the best teachers might have remained in the less efficient group, had it not been for the help and inspiration which were given by a wise supervisor.

Relations with pupils. The desire for a feeling of personal worth is universal, and it gives one a powerful impetus to activity in a wide range of situations. It is one of the most important human privileges. To be successful in our relations with pupils, we must understand the influence of this objective upon the behavior of young people. Such knowledge constitutes one of the major controls of instructors; without this knowledge, we can seldom be successful in dealing with young people.

The importance of recognizing another's desire for recognition and responsibility is widely known. This is revealed in the common statement that one must be diplomatic, for diplomacy is largely a matter of using methods that are gratifying to this ambition. It appears that what is needed primarily is not exhortation to appeal to this ambition, but instruction in methods of procedure.

The student may be likened unto a dynamo; a dynamo radiates magnetism, and that magnetism either attracts or repels. The teacher can make positive or negative appeals to the want of a feeling of personal ambition. Making positive appeals consists of addressing the student in a manner that either spares or furthers his pride, and of suggesting a course of action that will serve as a means of attaining a feeling of personal ambition. Making negative appeals usually creates

in the individual student fear that unless he does certain things, or refrains from doing certain things, he will lose prestige and respect. Not all persons can attain the same degree of success in attempting to persuade others by giving them feelings of personal ambition.

The psychology of dealing with young people, or of maintaining discipline and holding the good-will of the students depends upon action. If your "area" is well-rounded, you will have little or no trouble in maintaining discipline. The students will be kept so busy and be so enthusiastic with a conquering, burning determination to make good, they will have time for nothing but that which leads them nearer their coveted goal. Many teachers do not possess this ability or talent of action. When a class is called, they sit in a chair and expect to maintain attention and respect. This cannot be done in a general shop class without hurting the feelings of the students. If the feelings are hurt, the instructor, not the student, is at fault. Show me a teacher who walks quietly and with dignity, who knows his subject, and who possesses action, and I will show you a shop that never worries about discipline.

Every student likes to think that he is considered capable of making his own decisions, and that he is free to do as he chooses. With tact and courtesy, an incorrigible student's ego may be overcome. We need to recognize the fact that people

like to feel they are acting on first decision. If the decision is contrary to the well-being of the other students or to the edification of the shop, then perhaps a little inductive reasoning by the one in charge will solve the problem.

Psychology of personality is the direct study of individualities. Since no two blades of grass, no two leaves, no two insects are alike, certainly we can expect no two individuals to have the same mental, physical, educational, or psychological reasoning. We must, therefore, treat each student separately, and not collectively, in the matter of discipline as well as in the matter of holding good-will. The teacher whose attitudes are favorably established and well-developed frequently finds that these attitudes are transferred through his students to other classrooms or departments where the students will come in contact with other persons who need a change in point of view.

Let us be so dignified and friendly that our lives and characters may not be repellent, but be positive and have a lasting and everlasting power of attractiveness, one toward the other. Then the problem of discipline in our shop will be solved and the good-will of the students will be everlasting.

CHAPTER III

AREA AIMS, OBJECTIVES, AND CONTENT

I. GENERAL

The purpose of industrial arts. Accepting the theory that general industrial training is "worthy of the time of all and sufficient for many" a few rather general goals for industrial arts training may be set up which harmonize closely with all of our ideas of training; (a) training for citizenship, (b) vocational and educational guidance, and (c) intelligent consumption of material things. These goals will be best attained through as rich an offering in number and variety of shops, media, courses, or areas, as finances will allow, and they are:

1. Experience gained in performance of manual activities in greatest accord with sound practice, development of skills, and conservation of life and health.

2. Ability and resourcefulness will be assisted by adding to the pupil's knowledge a wealth of experience which he will be able to use around his home.

3. The boy will be led to see his need for training along definite lines of a kind best suited to his native intelligence and environment.

4. Numerous industrial activities will be explored, offering fundamental training in typical ones which will later serve as a basis for making a more intelligent choice of his

life work and also provide vocational preparation if the choice is made in the industrial field.

5. Sympathy with problems of industry from the standpoints of both consumer and producer will result from a first-hand knowledge of them.

6. Cooperative, as well as individual effort, will provide situations similar to those the boy will meet in life.

7. Educational guidance toward a vocational choice can best be given through these subjects.

8. Necessity for accuracy will become apparent.

9. The boy's motor tendencies can be satisfied and coordinated with his mental processes.

Many sets of industrial arts objectives have been formulated in the past, many of them very outstanding; but the list that seems to stand out above all the others was edited by John M. Trybom, who, with other members of the staffs of Industrial Arts departments from Detroit, Michigan, offers the following:[8]

1. To help to train a student for successful living in an industrial community, and thus prepare him for better citizenship.

2. To serve as one of the means by which a student may find his vocational aptitude and preference, and thus assist in guiding him into a vocation in which he will succeed.

3. To develop some ability in the use of tools that may serve as a foundation for future training in school or on the job.

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[8] John M. Trybom, Handbook on Industrial Arts and Vocational Education. (Detroit, Michigan: Board of Education, 1930), p. 17.

4. To help a pupil gain a general knowledge of tool processes and of manufacturing methods and materials valuable to all men living in a manufacturing world.

5. To train pupils in the coordination of mind and body by means of well-organized and interesting tool work on an individual or group basis.

6. To develop safety consciousness in relation to manufacturing conditions and the general use of tools.

7. To develop leadership and character by giving the students an opportunity to assume responsibility in such positions as "foreman" and "superintendent" in the school shop.

8. To develop abilities with tools used in the care of the home, and to instill interests leading to hobbies of construction.

9. To develop cooperation.

10. To teach a student to take and to carry out directions.

II. DRAWING

We must acknowledge that drafting is highly valuable and essential in the industrial arts field because it is the "universal language of industry." Drawings of various kinds are universally used to show accurately and clearly the forms, size, finish, color, and construction of an object. Architects and engineers alike use drafting to develop and record their ideas and to transmit them to those who are to execute their designs. Drawing has a definite contribution to make to the education of the youth of our schools. The following objectives of drawing should be considered carefully by the student-teacher:

1. To develop powers of visualization.

2. To give experience in exactness of thought.

3. To awaken the vocational interest of the student.

4. To strengthen the constructive imagination.

5. To give the pupil experience in exactness of expression.

6. To teach the reading and writing of the language of industry and to give practice in making modern working drawings.

7. To acquaint the pupil with many of the interesting and useful facts about industrial organization, methods, machines, and materials.

8. To acquaint the pupil with correct drafting room procedures and drafting as an occupation.

9. To familiarize the pupil with the contributions drafting makes to life through the development of an appreciation of art and to develop enduring avocational interests, skills, and knowledges.

10. To develop an appreciation of relationships between industries.

Content. In most school industrial arts activities the pupils are called upon to read drawings, blue-prints, or sketches soon after they begin to work. The situations in the school, as well as in practical life, calling for ability to read drawings far outnumber those calling for ability to make the things shown on the drawings. The mechanical drawing area must not be developed with the idea of specializing in any one field or trade. There

will be many students enrolled who will not enter any industrial field when they have completed their public school education; therefore, the area must be worthwhile for any student who may choose or elect the general-shop course as a part of his course of study.

An area in mechanical drawing should be constructed so as to be variable in length of time required for completion, making it applicable for different groups of students. It is quite true that no group will make the same development in any given period of time. Other variable factors affecting the drawing offering are the number of students in the area, the length of the class period, the frequency of the class meetings, the size of the laboratory space allotted for drawing purposes, individual differences, and many other things.

The experiences offered the beginner in drawing should properly include a study of the equipment of the draftsman and practice in the manipulation of this equipment. Sheet layout work, lettering, orthographic projection, free-hand sketching, working drawings, graphs and charts, pictorial drawings, elementary blue-printing, and detail and assembly drawings may be the most important learning activities of the beginner in drawing.

The activities of learning in the units offering drawing instruction should at all times be guided by the objectives of drawing previously mentioned. The student-teacher must always realize that a course or a part of a course is valuable only to

the extent that it develops the objectives of the course and of education as a whole. The teacher must remember that the interests of the pupils will vary with the units presented. Some of the students will be greatly interested in blue-print reading and construction, while others will be "bored to death." The wise teacher must try to organize the content of his course on a psychological as well as a pedagogical basis. If the teaching is organized in this way, it is unlikely that many students will ever be given opportunity to become indifferent to such an extent that their outlook on the field of drawing is an unwholesome one.

III. WOODWORKING

Wood is the chief material used in making many interesting and useful things in the school workshop and home workshop as well as in the factories. Woodworking not only affords the student an opportunity to make useful things, but it also provides him with much useful information about commercial occupations. The carpenter uses wood in the construction of houses and other buildings not only for the framework, but also for the exterior, the inside trim, the floors, the window and door frames, and many other parts. The home owner uses wood in the construction of shelves, flower boxes, trellises, fences, and other ornamental and useful things around the home and yard. The woodworking area of the general-shop course should prepare the student for at least the general-purpose work around the home.

The student-teacher must consider the following objectives of woodworking in the planning of any area for woodworking in the general shop:

1. To give the pupil experience in the use and care of bench-woodworking tools.

2. To give the pupil experience in the use and care of some machine-woodworking tools.

3. To give the pupil an understanding of the fundamentals of the use of various woodworking tools.

4. To develop a social spirit through cooperation with other areas and departments.

5. To add to the pupil's educational and social development through an acquaintance with industrial activities.

6. To encourage pride in personal achievement and accomplishment.

7. To provide an avenue for originality in design and execution.

8. To provide a knowledge of the shop materials that are generally useful to any citizen.

9. To provide exploratory experiences that may lay a foundation and help the individual in the choice of an appropriate vocation.

10. To develop manipulative skills and knowledges that are complete enough so that the experiences will be of usable value about the home and community.

Content. The instructional content of any course must not only challenge a student's interests, but also his ability. One of the best procedures to follow in this matter is to select projects for the woodworking area that grow progressively more difficult. It must be remembered that the effectiveness of subject-matter in the life of the pupil depends in a large measure on good instruction. The student-teacher must place emphasis first on pupil needs and utilize teaching content to serve those ends. Our most important consideration, therefore, in the selection of subject-matter is the need of the pupil.

If home construction or industrial woodworking occupies a prominent place in the community, the area of instruction offered in woodworking will be greatly influenced by this fact. It would be well in this connection to emphasize the important part that wood plays in the life of our communities and nation.

One elementary consideration will undoubtedly be the teaching of how to work with surfaced lumber and assemble projects involving simple joints. This unit of work will present to the pupil many aspects of the woodworker's work, such as the use of saws, hammers, planes, rules, try-squares, marking-gauges, vises, braces, bits, scrapers, and other tools. This phase of the area can be presented in many ways. Probably it will have its beginnings in the instruction of squaring stock to thickness, width, and length.

Many other items will undoubtedly be dealt with in the woodworking area that will be of informative value. Among these items might be the reading of a blue-print, a sketch, and a working drawing; the use of finishing materials; the calculation of lumber costs and preparation of material bills; the use and care of all common woodworking tools; the presentation of much related information concerning lumber; holding devices, occupations, finishing material, etc. If possible, our woodworking area should include instruction in wood-turning. Wood-turning is justifiable, not because of its occupational possibilities, but mostly because of its interest and skill-training values. If the area content is to be truly all-inclusive, some attention should be given to patternmaking. The construction of elementary grade solid and split patterns, solid patterns with cores, and patterns with loose pieces, as well as information concerning the patternmaking trade would be valuable and desirable.

IV. ELECTRICITY

Our civilization is hardly conceivable without the services of electricity, the applications of which have become very closely identified with social progress. Without fear of contradiction the statement can be made that the modern schools have not yet given the subject of electricity anything like the proportionate amount of importance that it has in modern life. Industrial arts teachers have recognized that the logical place to show the basic principles and varied applications of electricity

should be the industrial arts laboratory.

The most glaring weakness of assigning to the industrial arts teacher the task of offering instruction in electricity is the fact that very little or no instruction is being offered in this highly important phase of industrial arts in the teacher-training institutions at present. If teachers with no background for the teaching of laboratory electricity are sent out to give instruction in electricity, we can expect very poor instruction as a result. Most of our teacher-training institutions offer preparation for this phase of teaching in the physics department, and not in the industrial arts department.

Since this subject is so very important in everyday living in our modern world, it undoubtedly has a place in our comprehensive general shop. The following objectives are, therefore, applicable to the area of electricity:

1. To develop an appreciation and understanding of the applications of electricity in the home.

2. To develop an appreciation and understanding of the applications of electricity to the world in general.

3. To develop an appreciation and understanding of the relation of electricity to our social and economic development.

4. To obtain an understanding of basic electrical theory and information within the range of the pupil's ability, interests, and needs.

5. To discover aptitudes and interests in the various electrical industries and occupations.

6. To become aware of the relation of the electrical industries to other industrial fields and to society in general.

7. To be able to plan an approach in attacking any practical electrical problem.

8. To become familiar with the construction of common electrical devices and machinery.

9. To become familiar with the operation and maintenance of common electrical devices and machinery.

10. To become acquainted with the various electrical industries and occupations.

Content. In comparison with other areas of the general shop it is less difficult to vitalize electricity than certain other areas because electricity offers a wide range of interesting and practical content. Correlation with other areas of education both in the shop and beyond the shop are possible to a great extent. The area will provide a chance to gain abilities and attitudes acquired through demonstration, experimentation, observation, study, etc., with basic electrical theory and practice in all its interrelations with modern living. The practical construction of shop equipment and demonstration materials may play a minor part in the area offering. We must encourage our students to build projects involving the theory and practice of electricity in home workshops as well as school workshops.

In the setting-up of any offering we must hold in mind that our offering must be flexible and adaptable to the needs of the community. Therefore, it never seems quite desirable to aim at complete uniformity in the content throughout an area as large as a state or nation. Teachers must select such content as will best meet the needs of their students. In the general shop offerings, however, we must not narrow our choice of experiences to the extent that the work takes on any severe vocational aspect. Neither should it become just another text-book course, scarcely distinguishable from other purely academic courses.

This offering of electrical instruction should include a thorough study of the theory of the electrical circuit, followed by practice in such activities as assembling an extension cord, installing simple bell circuits, etc. A study of the principles of insulators and conductors and their uses would always be practical. Our offering should also include a thorough study of the generation of electric current; practice in electrical testing and meter-reading; a study of the relation of magnetism to electricity; and practice in making the various types of electrical circuit connections. Studies of electrical occupational opportunities should also be made.

V. BENCH METAL

The period in which we live is often called the age of steel. Perhaps it might more appropriately be called the

age of alloys, since steel itself is an alloy. Iron in pure form is never used commercially and can be produced only at considerable expense. The extensive use of iron and other metals began with the development of the steam-engine which supplied man with a powerful and reliable means of driving the machinery he had previously invented and which heretofore had been driven by the uncertain power supplied by slaves, animals, wind, or water.

Many workers are represented in the metal-working industry; for example, toolmakers, machinists, molders, pattern-makers, automobile workers, and many others. Bench-metal work is not a sharply defined trade in which the members perform specific tasks and develop specific skills to a high degree. The benchworker does the major part of his work on a bench and works largely with hand tools. Many benchworkers are among the most versatile and resourceful tradesmen found in industry. Since this group is not reported in the census separately, there seems to be no way of determining the number so employed.

The following general objectives are applicable as guides in forming our area of bench metal for the general shop:

1. To train the pupil in accepted practices in laying out work on metal.

2. To obtain manipulative experiences in the working of metals.

3. To develop an appreciation of the working properties of metals.

4. To acquaint the student with the proper ways of cutting different metals.

5. To develop knowledge of and understanding of the drilling processes as related to bench-metal work.

6. To develop ability to bend and twist cold metal bars and rods.

7. To gain an ability to tap holes and thread rods.

8. To become familiar with the operation of all common bench-metal working devices and machinery.

9. To develop an appreciation and understanding of the metal trades and their relations to our social and economic development and to the world in general.

10. To provide exploratory experiences that may lay a foundation for and help the individual in the choice of an appropriate vocation or avocation.

Content. The actual constructive work in bench metal should include the construction of such projects as lamps, flowerpot holders, brackets, and magazine holders.

Related technical information should include a study of the sources and manufacturing of iron, the importance of bench metal in industry, the tools used, safety practices related to bench metal, and many other important considerations.

Minimum instructional units should include practice in the laying out processes, use of measuring tools, holding devices, cutting tools, taps and dies, various metal fasteners, etc. The bending, twisting, drilling, punching of holes, and finishing of metals must have consideration. This work will give the student the background of the bench-metal worker's trade by manipulative work in filing, chipping, hack-sawing, riveting, drilling, pipe-cutting, and other operations.

The area content should also include practice in making a bill of material, planning and designing, blue-print reading and layout work.

VI. SHEET METAL

Sheet-metal work has been carried on by mankind for many centuries. When one attempts to define the field of sheet-metal work or to enumerate the number of people engaged in that field, he immediately realizes that he is confronted with a most formidable task. In fact, he is confronted with a problem that no one has, as yet, solved accurately. The United States census figures show approximately 164,000 people engaged as tinsmiths, coppersmiths, and sheet-metal workers. These figures probably include people engaged in such activities as roofing and in operating local tin-shops supplying and installing tin-work for heating systems, gutters, flashings, etc. on buildings.

When one realizes that the sheet-metal industry uses

sheets of metal ranging in thickness from 1/160 of an inch or less to 1/8 of an inch, then the terms sheet metal and sheet-metal industry become much more inclusive and significant both economically and socially. The production of new alloys of metal in sheet form has given society lighter, better, and faster automobiles, trains, airplanes, and ships. This is also true in the field of household utensils, household and office furniture, and a variety of containers.

This type of metalwork is particularly adapted to the shop where equipment is limited, because few tools are required for obtaining satisfactory results. The author has had many of his students make tools and devices to assist them in their work. Suitable hammer heads may be made from short lengths of discarded automobile axles. Chasing tools, chisels, punches, and raising tools may be made from worn-out round and square files. Wood forms for use in raising metal may be made from hard wood and are very serviceable.

The growing importance of the sheet-metal industry makes it practically a "must" in the comprehensive general shop. The following objectives are applicable to this study:

1. To give the pupil an understanding and appreciation of the modern sheet-metal industry.

2. To give manipulative experience in the working of some common sheet metals.

3. To provide an avenue for originality in design and execution.

4. To give the pupils an understanding of the fundamentals of the use of various sheet-metal working tools.

5. To give the pupil experience in the care of some sheet-metal working tools.

6. To encourage pride in personal achievement and accomplishment.

7. To develop manipulative skills and knowledges that are complete enough that the experiences will be of usable value about the home and community.

8. To become aware of the relation of the sheet-metal industry to other industrial fields and to society in general.

9. To become acquainted with the various sheet-metal occupational opportunities.

10. To be able to plan an approach in attacking a practical sheet-metal problem.

Content. The growing importance of the sheet-metal trade makes correlation with other areas of education both in the shop and beyond the shop possible to a great extent. The area will provide a chance to gain abilities and attitudes acquired through demonstration, observation, study, etc., with all their interrelations with modern living. The practical construction of shop equipment may play a major part in the area offering. The justification will be that these constructional experiences may be offered with materials readily available to anyone, hence of practical value to the layman.

The beginner in sheet-metal work must first become familiar with the layout processes in sheet metal. This may include the making of sketches, drawings, blue-prints, or other planning devices. Most elementary sheet-metal work requires knowledge of certain principles of drafting. The layout work should be done as a part of the work on the projects.

The use of various tools to construct sheet-metal projects already laid out will necessarily include the use of cutting tools and devices, drills, and punches. A study of the forming of sheet metal and the various ways of making sheet-metal joints is also desirable.

A knowledge of the various ways of reinforcing sheet metal such as hemming, beading, wiring, crimping, burring, raising, and turning should be included in the area content. The use and application of soldering devices and appliances and other commonly used fastening devices for sheet metal have their place in this area of study.

VII. HOME MECHANICS

For many years the industrial arts offerings have consisted chiefly of the making of things. No consideration was given to the practical value of the ability of boys and girls to repair equipment used in the home. A few progressive teachers such as Earl L. Bedell and Ernest G. Gardner began experimenting with work of this kind. The interest and the

acknowledgment of value from both students and parents was instantaneous and wholehearted. Letters from fathers and mothers to teachers have testified that an offering in home mechanics makes a very strong appeal to parents and students alike. The variety and the practical nature of the content make it an easy area in which to hold the interest of pupils.

The life of a house is estimated at about fifty years. Many of us live in houses that are several years old, and the equipment installed now in these houses represents a long period of development in design. The selection of this equipment and its maintenance is a matter of pride and of vital interest to us. Students of adolescent age take great pride in knowing that they are a part of the home and have part of the responsibility of keeping it in good condition.

The objectives of an area of study of this type in our general shop program overlap the broader objectives of education probably to a greater extent than any of our other area offerings.

1. To encourage more worthy home membership.

2. To become familiar with the use of a variety of tools generally available for home use.

3. To provide an opportunity for the use of initiative around the home in dealing with problems.

4. To encourage a continuous practice of citizenship.

5. To inspire confidence in the pupil's ability to make simple repairs about the home.

6. To interest the pupil to take pride in keeping the home in good repair.

7. To develop an interest in owning good tools and in caring for and using them properly.

8. To develop ability to attack a problem pertaining to the maintenance of household appliances.

9. To give consumer knowledge about the selection and use of the products of industry.

10. To promote the use of handcraft for leisure-time activities in the home.

Content. The content of the home-mechanics offering should, more than any other offering of the general shop, be based on a careful community survey. In addition, it will be found desirable to base the area on a study of procedures in other cities. The general content of the area may be somewhat as follows: the reading and making of simple working-drawings; care and use of hand tools; selection and care of clothing; care and adjustment of plumbing; care and use of finishing materials; care and adjustment of electrical devices in the home; care and repair of metal articles in the home; selection and arrangement of home furnishings; care and adjustment of windows and doors.

The instructional divisions or units of the home-mechanics area should be determined by grouping the home maintenance and consumer needs which have enough similar characteristics to permit efficient instruction. For example, one unit may be based on

the care and adjustment of windows and doors. The proper maintenance of windows and doors is very important in the efficiency, safety, and convenience of home life. Screens and storm sash must be changed with the seasons. Locks and hinges must be kept in good working order for efficient operation and to protect the home from theft. Windows must be properly cleaned for sanitation and light.

VIII. MODEL AIRCRAFT

The importance of aviation in the curriculum of the schools of America has been realized but lately. Everywhere there is a demand for more airplanes and more pilots for mastery of the air. The war will undoubtedly be won by air power and future defenses will be associated in a large degree with the air force. What is true of military strategy is equally true of commercial development. The post-war era and the planning for stable international relationships will be concerned to a great extent with the extension and maintenance of commercial air trade-routes. It is important that the industrial arts studies should be so oriented as to develop an understanding of this new method of transportation and its effect on the progress of the United States of America.

Since October, 1935, Germany has decreed the teaching of aviation from kindergarten through secondary school. Monthly magazines entitled Luftfahrt und Schule (Aviation and School) have been distributed to all teachers. A series of textbooks on

the fundamentals of aviation and allied topics has been prepared and is being studied by all pupils in the German schools. Such teaching has been carried on in other countries, including Italy and Japan. It will not be an easy task for the schools in the United States to catch up with the extensive program that these other countries already have under way, but we not only must catch up with it, we must surpass it and subsequently redirect it from military to social purposes.

The cooperation of the school shop has already been enlisted in this program by the request and the fulfillment of the request that the United States Navy made shortly after the entrance of the United States into the war for models of warplanes to be used in gunnery and detection schools. This work in aircraft building becomes a work of prime importance in the teaching of industrial arts, especially in the general shop.

The following objectives have been formulated in partial justification of this new program:

1. To give the student a concrete understanding of basic aviation principles.

2. To develop certain manipulative skills in fine craftsmanship.

3. To discover the relationship of industrial arts to aeronautics.

4. To discover and apply the basic principles of aerodynamics and the theories of flight.

5. To develop shop mathematics related to aerodynamics.

6. To develop an awareness of the future of aviation.

7. To explore the occupational possibilities of aviation as a life work.

8. To train the pupil in carrying out the plans and blue-prints of model aircraft.

9. To provide an avenue for originality in design and execution.

10. To encourage pride in personal achievement and accomplishment.

Content. The United States Navy has given us a guide in the selection of materials for the work to be given in the aircraft area of the general shop. The construction of accurate scale model warplanes is very instructive and useful. This construction program, although comparatively new to the general shop, is in reality an old idea -- that of model airplane building, long a hobby of great numbers of boys and girls.

Industrial arts can make many unique contributions to the program of "air-conditioning" the youth of America. If the project idea is to be carried out in the content of the model aircraft offering, an integration with other school departments would suggest such projects as making a model airport, child-sized planes, and toy airplanes. Experimental equipment could also be constructed such as a wind-tunnel, a globe-stand, and

devices for showing "lift" and "drag."

It is the opinion of the author, however, that for the present the offering of the model aircraft area should consist primarily of a program of model building, such as is suggested by the United States Navy program, including both gliders and flying models. In such a program of instruction, implication for teaching the principles of aerodynamics, related science, and mathematics is indicated.

CHAPTER IV

ADMINISTRATIVE PROBLEMS

A number of administrative considerations in the field of industrial arts are worthy of some discussion in a treatise of this type. An attempt will be made to touch upon and discuss a few of the most important of these considerations.

I. THE SHOP AND ITS EQUIPMENT

General considerations of shop-planning. The following principles were formulated, set up, and revised by twenty experienced industrial arts teachers in conference at Iowa State College recently. These principles will form an excellent check-sheet for the use of any person, teacher or administrator, who is intrusted with the planning of the school shop. Professor William L. Hunter has edited the list of principles that follow.[9]

1. All parts of the shop should be visible to the teacher.

2. Natural lighting area should equal at least one-fourth of the floor area of the shop.

3. When possible, have the teacher's desk in the vicinity of the entrance.

4. Block off or fill up recessed spaces.

5. Arrange equipment to permit free use of aisles.

6. When possible, lockers should be inside the shop and recessed into the walls.

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[9] William L. Hunter, "Principles of Shop-Planning," Industrial Arts and Vocational Education, 23:38, February, 1934.

7. The floor should be adapted to the type of shop work, concrete floors being avoided when possible.

8. Provide for maintenance of tools and equipment.

9. Place the key cabinet where it is most convenient.

10. Machines commonly used in sequential order should be placed in the order of their operation.

11. Shop doors should open outward.

12. Avoid placing students where exposure might affect their health.

13. Arrange machinery for maximum safety.

14. Utilize to a maximum naturally lighted areas.

15. The blackboard and bulletin board should face the light.

16. Machines should not be placed on columns or pipes which will transmit sound to other rooms.

17. Avoid an open-beam ceiling.

18. Walls and ceiling should be a light color.

19. Equip with self-contained portable machines whenever practicable.

20. Have transparent partitions between the shop and its auxiliary rooms.

21. All of the shop should be on one floor when one instructor is in charge.

22. Do not permit students to regularly use more than one entrance to the shop.

23. Locate toolroom and tool panels so as to avoid excessive travel.

24. Adequate storage space should be provided.

25. The benches and storage equipment should be large enough to accommodate standard sizes of material.

26. Have fire extinguishers of the correct type and size readily available.

27. Keep obstructions out of the line of light.

28. Choose north light when possible.

29. Have soundproof floor, ceiling, and foundations for machines.

30. All machines should be controlled by a master switch under lock and key.

31. Where necessary, have a dust-collector for machines.

32. Windows should extend to the ceiling from a point as low in the wall as practicable.

33. Place equipment so as not to interfere with opening of doors.

34. Provide steel cases and waste containers for inflammable materials.

35. Place the most frequently used equipment near the center of operation.

36. Have an adequate first-aid equipment case readily accessible.

37. Have a metal-covered glue table.

38. Locate machines so as to accommodate maximum-sized material.

39. Ground all power-machines and insulate all metal furniture in an electrically powered section of the general shop.

40. Plan the shop so as to reduce disciplinary problems to a minimum.

41. Distribute items of similar equipment so as to be of value to all workers.

42. Paint safety zones around dangerous machines.

43. Equip dangerous machines with effective guards.

44. Provide exits for fumes, gases, and other injurious substances.

45. Do not have large amounts of lumber, supplies, and materials openly accessible to pupils.

46. Locate equipment so as to avoid all shadows possible on working areas.

47. In determining proper lighting facilities, secure the recommendations of a competent lighting engineer.

48. Avoid using the shop as a passageway to other rooms in the building.

49. Floor of shop should not be more than two feet below ground level.

50. When practicable, have all the floor space of the same floor on the same level.

Equipment for suggested areas. One must be sure that the aims he has set up for his course of study are for the betterment of the boy and in keeping with the progress of the community. As previously mentioned, the aims of industrial arts may be divided into two groups, namely: (a) manipulative, and (b) non-manipulative as follows:

(a) Manipulative aims provide opportunities for self-expression, training, and experience in common skills everyone should possess and provide trade-exploratory or try-out experiences in typical trades.

(b) Non-manipulative aims provide training in industrial arts and industrial arts appreciation (partially manipulative). They provide a natural medium for guidance, educational and

vocational, and a knowledge or understanding of the relation of industry to our social-economic welfare.

Industrial arts courses often prolong the educational life of a boy by encouraging him to remain in school. They give the boy a chance to show his inclinations and abilities through experiences. They give him a knowledge of occupations, through auxiliary studies and related information. They offer experiences in occupational work and also provide training in industrial arts appreciation.

Before we can determine what tools and equipment are necessary for the shop, there are several things that should be taken into consideration. To acquaint himself with the community needs, one should find out by a survey what the vocational interests are and the type of fundamentals needed to do this type of work. This survey will be used to aid in a determination of the areas to be attempted in the comprehensive general shop program. After finding out these things about the industry of the community, the planner should then acquaint himself with school shops presenting a program similar to the discovered situation. While making a survey of industry and school shops, give particular attention to the type of machinery and equipment needed to make similar operations. The findings made on field trips and information received by talking to shop teachers and foremen will be immensely valuable in avoiding errors made by others. There should

not be any tendency to copy or surpass any other school or school system.

Next, it will be necessary to make a survey of the suggested areas to determine the occupational work carried on and also to find the extent of the operations required to complete the finished product. The school is not so much concerned with the finished product as it is with the fundamental operations that it takes to complete that product. We are now ready to make the decision as to the purpose, content, and procedure to follow with our instructional material.

After deciding what we will teach, to what extent we are going to teach it, and how we are going to teach it, we are ready to purchase tools and equipment.

Tools and equipment may be classified into four groups: (1) The constant tools without which the individual is unable to work to advantage (work-bench, plane, saw, try-square, ruler, etc.); (2) those large, fixed pieces of equipment for common use in the preparation and care of stock and tools for work (table-saw, planer, tool-grinder, etc.); (3) frequently used tools or supplemental tools, one of which will supply the needs of a group of boys (various saws, cabinet clamps, drill bits, steel squares, etc.); and, (4) special tools for meeting the occasional or the unusual needs (draw knife, expansive bit, axe, etc.).

After the classification has been studied, then there are some other modifying factors entering, such as: (1) The location and floor space to be occupied by the equipment; (2) the size

and number of classes to be accommodated; and, (3) the amount of money available for the purchase of the equipment.

Too many teachers have failed in the selection of equipment because they have failed to formulate a definite statement of the kinds of work to be undertaken, the purpose of the work to be done, and the courses to be pursued. It is best to plan an ideal shop to meet the definite statement, without regard to cost, housing facilities, or other conditions; then to modify the ideals set up to meet the limitations and needs that prevail locally.

The inexperienced teacher might see the ideal situation as one in which each student is provided with complete equipment. This means that there will be many tools that will receive but little use; therefore, the cost of equipping a shop becomes a discouraging factor. This is what is meant by an ideally equipped situation: one that enables each student to have access, without delay or loss of time, to the necessary tools for the performance of the work at hand. Then again, access to tools is not a question of equipment only, but one of organization as well. Without organization there would be confusion, delay, and much wasted time as a result of all wanting to use the machine or tool at the same time. Thorough organization will mean that every tool will be in continuous use without delay to the pupils.

The usefulness of the tools is an additional consideration. A teacher is hired to teach courses in shop work, and to appreciate fine work and good design. He will consider certain tools

absolutely necessary. He must realize that the tools he buys will be used by his successor, who is also an efficient instructor. The instructor of the general shop must realize that he is teaching general subject-matter only and not specializing in any certain field; therefore, he should not buy equipment for one specialized field entirely. Special tools may be found discarded or idle in a case of this kind. Equipment should be purchased for the use of the students and not for the instructor, although the teacher may have highly specialized talents and training. An instructor should keep in mind that the pupil is only beginning to learn how to use machinery and equipment. This equipment and machinery should be of simple design, construction, and operation.

The cost of education has become an important social problem. The cost of equipping industrial arts laboratories has been exceedingly high in some instances. There are several contributing factors in a consideration of the cost of equipping a shop; namely, money available, offered "discount" reductions, capable salesmen, and shop appearance. The cost should be given due consideration, and often can be reduced by making an intelligent analysis of the situation from various points of view before the purchases are made. It is not necessary to buy costly equipment to obtain a maximum of efficiency.

Money available now and the prospects of money available in the future should be considered in planning a shop. Whether

to spend all the money now on a few machines or to plan to spend part of it now and spread it over a larger area is a problem. The type or class of equipment will determine the answer to this problem in part. If there is any chance of getting another allowance next year, one could get a better class of equipment by buying some now and more next year. It may inconvenience the program a little, but good organization will help.

A knowledge of the community ability to pay for and to support such a program will be invaluable. The development of a comprehensive program will help stimulate a need for more and perhaps better equipment. It may be advisable to spread the small amount of money available over as wide an area as possible.

The teacher must remember that the equipment in the shop may greatly influence the boy while in the shop. His future attitudes are affected by the tools with which he must perform the operations. If the means for making a project are at hand, a student will give the teacher very little trouble. The lack of tools often causes disciplinary problems, for boys may wait and try to slip tools away from a boy that is using them.

Laboratory planning and arrangement. Planning the arrangement of the general-shop equipment is a problem requiring good judgment and intelligence on the part of the teacher. After working out the type of offerings and the equipment lists, the next job is to plan an efficient arrangement of the equipment.

If this organization is carefully done, time can be saved and disciplinary problems avoided or made fewer. After some of the factors involved in setting up a convenient shop arrangement have been considered, we can plan our layout with more intelligence.

Beyond a doubt the greatest single influencing and determining feature of the comprehensive general shop and its curriculum is the space available. In a very great percentage of high schools the buildings were designed and constructed before even "manual training" was in the curriculum. Thus space for the modern shop had to come from what was originally a coal room, basement storage space, or a toilet room. This type of beginning will make the problem of shop planning the major consideration in the development of the industrial arts program. Not only does it offer a problem to create a decent working place, but it creates a situation in curriculum building that may not be consistent with good teaching practices in industrial arts instruction.

Light must be considered. Noise is a factor, and efficient operation of apparatus must be in mind. Various pieces of raw material which have to be reduced to smaller dimensions require sufficient space for handling in machine operations. The planning or drawing area, which requires a certain degree of cleanliness, should obviously be as far from the dust-producing machines as possible. Yet, since everyone works in it, and will be constantly moving to and from it, a central location

will save steps and will decrease the amount of passing. The finishing area needs to be so located that there will be comparatively little dust, and yet a free circulation of air must be provided. Portable-type machines for wood and metal are adequate for the instruction in these areas. They take up less space than large-type apparatus and the outlay is only a fraction as great.

Hand tool arrangement is another item of organization that requires much thought. Should the hand tools be placed in a separate tool room, arranged on a panel, or in portable cabinets? One of these methods may be better than the others. There are a number of controlling factors, not the least of which is the arrangement of the building. Because of the complexity of the problem of suitable arrangement, the novice in general planning had best call in an expert. Such an expert is one who has conducted or is now conducting a successful general-shop situation. This person should have a background of considerable research in organization.

Items such as heating and ventilation, safety, acoustics, and lighting should be given consideration in the arrangement of the shop. At least two hundred cubic feet of air space should be available to each pupil. Even more than this will result if the shop enrollment is kept within the limits of fifty square feet of floor space per pupil. Hot air systems with fan blowers are satisfactory if the air vents are properly located to get a cross room movement of air. Cold air ducts must be sufficient to

remove this air. Steam is an ideal heat if small fresh-air intakes are arranged to bring air in over the radiators. Twelve cubic feet of fresh air per minute for each square foot of floor space should be available. An average temperature of 66° to 68° will induce good work in shirt sleeves.[10]

Natural light entering from the north is most desirable. Window space should equal one-fourth of the floor space. Benches and machines need to be placed so that the light comes from the worker's left or from the front.

The type of ceiling, walls, and floor will partially determine the amount of shop noise. Ceilings should always be lined and walls should be constructed with some type of sound-proof board. Noisy machines should not be located near corridor openings. Worn machines, especially those with worn bearings, should be repaired to decrease noise.

Proper arrangement will be a great step toward the complete elimination of accidents. This statement is self-explanatory and further discussion of safety will be found in Chapter V.

II. TEACHING -

Content and material. Administrators should realize that it is more than a one-man job to develop a general shop

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[10] Roger J. Weaver, "Initial Steps in Planning Shops," Industrial Arts and Vocational Education, 30:238, June, 1941.

and prepare the teaching materials. However, the work is so interesting and challenging to the teacher that he will usually devote all the time necessary to make a success of his shop. Many superintendents in the smaller towns hire a good industrial arts teacher and then make the mistake of assigning him extra duties such as the coaching of athletic teams. The general-shop program is doomed to failure where the administrative officers fail to appreciate the amount of time and energy necessary to develop and conduct an adequate general-shop program.

The school shop can not justify its program if children do nothing but make traditional objects out of wood or metal and then take them home as they did a generation ago. The functions of the modern industrial-arts program require a much more significant contribution. The better and more modern industrial-arts programs now provide for the following round of activities, information, and appreciations that are truly worthwhile:

1. Activities in as many industries as school shops and laboratories will permit.
2. Use of typical and important industrial tools.
3. Experience in production methods.
4. Experience in handicrafts.
5. Acquaintance with the organization and operation of industrial and commercial enterprises.
6. Study of safe and hygienic ways of doing all types of work.

7. Practice in identifying the more important methods employed by industry.

8. Selection and use of some of the common products of industry.

9. Utilization of salvaged materials or products for project work.

10. Interpretation of the sources, principles, and applications of power, such as steam, water, internal combustion, and electricity.

11. Study of the origins and effects of significant inventions.

12. Study of materials from source to completed object.

13. Study of vocational opportunities, living conditions, remuneration of workers, controversial questions pertaining to capital, labor, and technology.[11]

In our teaching in the school of today we must provide an education for a society that is in many ways fundamentally industrial in nature. Therefore, in planning the content and materials of the comprehensive general-shop offering, a program must be set up that will contribute to this general goal. The program offered concerns itself with and draws its subject-matter from the types of sources included in the items one to thirteen, inclusive, listed above. The point of view taken is thoroughly sound and modern in emphasizing that manipulation, though important, is but a means to an end, and can be only one part of the whole program. It is imperative that there be included a study of the

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[11] Industrial Arts: Its Interpretation in American Schools, U. S. Office of Education, Bulletin #34, pp. 9-10, 1937.

social-economic character of the present day. This study should enable the pupil to gain certain abilities, knowledges, appreciations, and attitudes that are vital in modern life.

Presentation. The problem of teaching at the highest degree of efficiency is one that must concern the teacher long before the first meeting of his class. Much of the planning as to presentation of materials must necessarily be done far ahead of the actual presentation to the class. It is highly important that the general-shop teacher, as much or more so than any other teacher, be prepared to present the entire year's work before even the first day of classwork becomes a reality. In this advance planning the most important consideration must be given to the teaching devices that will be utilized in teaching. The teaching devices applicable to the general shop have been enumerated as follows by Newkirk and Stoddard:[12] (1) Individual instruction, (2) Group instruction, (3) Class instruction, (4) Demonstration, (5) Reference materials, (6) Talks by professional and business men, (7) Objective tests, (8) Moving pictures and slides, (9) Charts and pictures, (10) Class excursions, and (11) Individual instruction sheets.

The nature of the general shop will make the method of individual instruction the most common method or teaching device

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[12] Newkirk and Stoddard, op. cit., p. 43.

used; therefore, a large amount of the teacher's time will be spent in individual instruction. The group instruction method or device will be used to a large extent as a time and effort saving device where the instructional needs of the individual members of the group are similar and time can be saved by giving aid to the group as a whole. The class instruction device will be used less frequently in the comprehensive general shop because the various groups will have but little in common. When items of immediate interest to the entire class come up, class instruction is a useful device. The use of the demonstration device or technique will be largely confined to the presentation of the procedures involved in new manipulative processes that are, or soon will be, required of the class or group as a whole. The time used in the demonstration should be short and the presentation and related discussion should be brief and to the point.

The selection of reference materials will require much careful consideration. Reference will be made to these sources of information on the instruction sheets used by the individual members of the class. These materials must be protected but readily available to all. The beginning teacher will find that job sheets alone are inadequate to completely satisfy the needs and wants of the students. A good library of reference materials to supplement the teaching offered by the instruction sheets is desirable. As the instruction sheets become better adapted to

the course of study, fewer references will be needed. Well-written instruction sheets should contain the materials that are essential to the unit of instruction which they represent.

Short talks or discussions led by interested and qualified outsiders will be profitable. This device is especially advisable and valuable as a part of the guidance program. It is best to outline a program of discussion for these outsiders so that the principles of economy and organization will be incorporated in the talk. This avoids rambling discussions and gives a clear presentation of the speaker's work as it is related to the activities of the class.

The testing program of the shop is important as a teaching device because of its value in diagnosing difficulties, measuring results, motivating learning, and improving instruction.

We have recently recognized the teaching values of the various visual instructional aids. Moving pictures, slides, charts, and pictures fall into this category. Few of these aids require much of the teaching time of the instructor and all are useful in supplementing and strengthening the demonstrations. These aids are very helpful in giving related information and in objectifying important procedure steps. More and more emphasis is being placed upon the use of these aids. Class excursions are informative in about the same manner as the visual aids and talks by interested outsiders. These trips must be carefully planned

if their full value for instructional purposes is to be realized; otherwise, they will be of doubtful value.

Selvidge[13] has summed up the chief classifications of the individual instruction sheets very well as follows: (1) The operation sheet, based upon units of instruction of the trade involved in work jobs, and not upon jobs; (2) the information sheet, presenting problems with the necessary information for their solution; (3) the assignment sheet, giving a definite statement of problems and questions designed to direct the reading, observation, and thought of the pupil; and (4) the job sheet, prepared for specific work jobs containing instruction for these jobs and for no others. The individual instruction sheets are very valuable aids in teaching areas of industrial arts in the general shop because they allow the pupils to advance at rates in keeping with their individual differences.

Evaluation. The teacher's task of giving grades is very difficult. The matter of grading is one of the most effective factors in education, not from the fact-finding standpoint, but from the standpoint of the development of attitudes and self-confidence. It often seems that too much emphasis is placed on grade-getting and not enough emphasis on the essential and indirect learning that is to be measured.

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[13] R. W. Selvidge, Individual Instruction Sheets (Peoria, Illinois: Manual Arts Press, 1926), p. 13-15.

Individual interests, home environment, native endowments, past experiences, and many other factors vitally affect the work of the pupil. It is easy to understand that it is not possible for the teacher, both from the standpoint of time and practicability, to accumulate all of these factors and consider them at grade time. A part of the fault lies with the pupil himself for not confiding in the teacher more than he does, so that the teacher may know him better and understand his problems and needs more fully.

Indirect results of teaching should also be considered in grading. If a teacher tries to set a group of standards by which he can measure each pupil and grade him according to his position on a scale, he is sure to run into difficulties. If such a system is used, the teacher neglects to remember that he is measuring the pupil entirely on the tangible and objective work that he is doing and has entirely ignored the personality of the individual and the attitudes, ideals, and habits that have been formed because of the work in spite of the social influences and environment to which the pupil is subjected. Many of the facts which we teach are taught for the purpose of establishing desirable attitudes and ideals to help the student become a better citizen, well-equipped for life and living.

Much of the value of making a footstool, a table, or a lamp, or any other article in the shop lies not in the article

itself but in the satisfaction which the pupil gets from making it, and in the things which he learns about construction, proportion, etc. This sense of satisfaction gives the pupil a feeling of confidence in his ability, which is the important thing after all.

The question as to whether or not failures are ever legitimate is certainly a grave problem. The type of teacher who thinks he must regularly fail a certain per cent of his pupils just to balance his curve of normal distribution has certainly been outmoded. This way of grading has passed into the discard.

Failure probably should not be based upon the amount of learning absorbed. Every individual is able to learn to a certain degree. It is not so much what and how much the student learns, but how he uses it. There are many intelligent men in our prisons today because of their failure to use their knowledges in the right way. Failing grades should never be given without due notice and a prior conference so that the pupil will have the opportunity to improve and bring his work up to the passing level. A failure does not become legitimate until the pupil himself refuses to do anything about it.

In shop work there is little or no outside preparation and little opportunity to work after school hours; absence is an important factor to consider in giving grades. A certain amount of absence is to be expected, for which no deduction in

grades should be given. Rarely, if ever, does a pupil ask to make up back work. If the pupil does ask to make up work in the shop, a time worn assignment is to hand him a book on some related subject in industrial arts and demand a written report on the subject. If such a pupil does not attempt to make up lost time, then probably his grade should be lowered in order that he will learn the value and need of regular attendance.

Probably we should give extra credit for home shop work. It is inadvisable, though, to give extra credit for several reasons. One is that we may be shown work that some one else has done; for example, the boy may bring his father's hobby-work to school and pass it off as his own work. Another reason is that homework will probably be done without supervision and is very likely to be of a poorer grade, and, if supervision is given, it will probably be given by the father or some other member of the family. If the teacher attempts to criticize such work, he may reap antagonism from those at home who had a part in the supervision.

Shall we give lower grades to the student who is habitually lazy and often idle than we give his more industrious fellows? The teacher will have to study each case very carefully. We consider the lazy student as one who lacks interest. The real cause of his idleness may be his health, a rebuke, former grades, failure to master elementary tools of learning, and the like. If we can discover his interests, we may be able to approach him with a different viewpoint and thereby gain a more satisfactory response.

The best teacher in the world cannot entirely eliminate all disciplinary problems. It is natural for pupils to get into some mischief with others with whom they associate; but, we must remember that a busy pupil will have little time to get into serious mischief. There are few cases where a valid reason for lowering a grade would be the deportment of the pupil concerned. Basing grading upon discipline is a very subjective matter and is difficult to justify.

A teacher must never issue a grade that he cannot defend completely as to its validity. Parents, more often than students, may cause a great deal of trouble unless the teacher can sit down and carefully point out reasons for the grade given and make definite suggestions as to how it can be improved.

Seldom is the placing of undue emphasis on examination marks justifiable from the point of view of the industrial arts teacher. The measurement of tests is as objective as possible, but there is still much that is left untested. The student should have a grade that measures everything he gained from the course, not just the few isolated items of details that he was able to use to make a showing on a test. About the only time that we can really sympathize with the teacher who admits that he has based his grades mainly on the test or tests that have been given, is when there are a large number of pupils present in a course lasting only a short time, thereby making an acquaintance with individual students almost impossible.

CHAPTER V

ADDITIONAL CONSIDERATIONS

I. THE CONFERENCE

A valuable learning device for the student-teacher is the group conference. This is also a most valuable way of evaluating the worth of the student-teacher. If these conferences have, in reality, the value attributed to them, then participation in them by student-teachers should carry weight in the final rating. Through an exchange of ideas and experiences, not only will the supervising-teacher and the student-teacher both receive inspiration, but the supervising-teacher will also be afforded an excellent opportunity to get an insight into the intellectual and emotional processes of the student-teacher. Attitudes toward conferences furnish an insight into the character and professional zeal of the student-teacher. Consideration should be given to those thoughtful and earnest beginners who, without the sordid approach of the "grade hound," go to the trouble of seeking out their various instructors or specialists in order to get advice as to the best procedure or body of materials suitable to their teaching situations. Through these conferences staff members are able to judge the student-teacher's progress.

The student-teacher should be made to feel that individual conference is one of his greatest sources of help and inspiration.

He should be led to look forward to this part of his work with pleasure and confidence. He should be made familiar with the principles underlying both individual and group conferences. The following principles underlying these conferences are suggested as bases for starting:

1. A teacher of teachers is, in general, subject to the same principles as the teacher of children.

2. Conferences should be cooperative. The supervising-teacher should do some listening.

3. Clearly defined needs should be met with underlying principles of good teaching. Trivial details should be omitted.

4. Results of teaching should be based upon the knowledge, skills, and attitudes acquired by the pupils whether or not the student conforms to procedures and methods employed by the supervising-teacher.

5. Criticism should be largely constructive rather than destructive.

6. Teachers should be guided toward habits of self-appraisal and self-activity.

7. Conferences should take into account the individual differences of student-teachers.

II. SHOP SAFETY

The general rules governing the school plant are of a rather flexible nature, and they are applied according to the

temperament of the persons who made them. But conditions are far different in the shop where power machinery is used! The most important and most binding rules there are not made by man. Instead, each machine has its own set rules. The jointer, for example, says, "If you put your fingers into my knives when they are turning, you will have them cut off." The tragic fact about this statement is that the jointer never fails to apply this rule that it sets up. The table saw and the rest of the power machines have similar rules. They, too, always enforce them. The machine will never be caught asleep on its job of rule enforcement. It will never have the least bit of consideration for or take pity on the inexperienced operator.

If the student-teacher will present the problem of safety in this manner to his students, he will find they are usually willing to listen to a lesson or watch a demonstration on the correct methods of handling the machines in the shop. He must also stress the fact that machines, even when properly safeguarded, are always dangerous to the careless operator. When using a machine, it is always necessary for the operator to concentrate on the particular operation in which he is engaged. His mind and eyes must not wander to other activities. The operator must never hurry if he wishes to avoid accidents. "Haste makes waste," is only too true a statement in regard to shop safety. All machines should be equipped with safety devices.

Guards should be placed on belts and pulleys to eliminate much of the danger of injuring the operator.

The teacher must not allow any student to use any of the machines until he has been shown how to use them properly by a class demonstration, or by individual instruction. The careless or the indifferent student should not be allowed to use machines at any time except under direct supervision of the instructor, and even with such a precaution, permitting such students to operate machinery is a dangerous risk that most teachers wish they could avoid entirely.

A foreman in a woodworking plant, when asked what the principal or most common cause of accidents in his shop was, answered that it was due to men trying to "look backward" while operating saws and planers or shapers. A momentary turn to speak to another worker or to see what is happening in some other part of the room and the damage is done. "Keep your eyes on the machine" is advice more valuable to the machine operator than is the rule "Keep your eye on the ball" to the ball player. The student who calls out to a fellow worker engaged in sawing or planing is often responsible for a serious accident. When the students thoroughly understand the necessity of "Safety First," the danger from accidents is materially lessened.

Safety as applied to procedures in a school or industrial shop resolves into using one's common sense and good judgment.

Most of the modern machinery found in the school shop is equipped with guards and devices designed to protect the operator and make operation of equipment as safe as possible. However, statistics show that guards and other safety devices afford only fifteen per cent protection. Thus eighty-five per cent of all accidents in school and in industrial plants are due to a factor or factors that cannot be guarded against by mechanical devices. This statement holds a great truth for the teacher of the general shop, namely: The principal factor accounting for preventable accidents is the human element. It may seem strange, but this same percentage attributable to the same human element applies not only to machine tools found in the school and the industrial plant, but to operation of automobiles, farming, homemaking, and most other activities. Most accidents, therefore, are the result of someone's thoughtlessness, carelessness, or lack of consideration of the rights of others. They are avoidable if one will just acquire the habit of <u>thinking</u> before <u>doing</u>.

If we say that persons prone to accidents are habitually careless, thoughtless, and reckless, the opposite may usually be said of persons whose records are reasonably clear; that they are habitually careful, thoughtful, conservative, and considerate. Safety, then, is principally a matter of just striving earnestly to learn and follow safe practices and procedures at all times. It really resolves itself into a matter of many more <u>do's</u> than

dont's. It must be remembered that every person who has achieved recognition as a careful, considerate, thoughtful, far-seeing workman has never failed to practice daily all the rules of safety.

III. GUIDANCE

Every teacher in the public schools should feel his responsibility in the field of guidance. While every true teacher is willing and anxious to assist in every possible way in the guidance of his students, there is no teacher who has greater opportunity in this important field than the teacher of industrial arts, and especially the general shop teacher.

Claude F. Turner of James Monroe Junior High School, Seattle, Washington, has made a rather clear statement of the meaning of guidance.[14] He said, "Guidance cannot be construed as something you do to a child, but rather as a process whereby you build up in him the desire and power to do something for himself."

The following inscription is over the entrance of the College of Education High School at Greeley, Colorado, "Whose teaches a child labors with God in His workshop." To this inscription, Mr. Turner says we might well add, "He who inspires

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[14] Claude F. Turner, "Guidance -- The Shop Teacher's Responsibility," Industrial Arts and Vocational Education, 26:269, September, 1937.

a boy so that he glimpses his own possibilities for some honorable service in life is a master craftsman."[15] Certainly then the industrial arts teacher has an opportunity to render a worthwhile service.

Before attempting to do any work in guidance we should have a definite conception of the purpose of guidance. It is not the purpose of guidance to decide for young people in advance what occupation they should follow, nor to project them into life's work at the earliest possible moment, nor to classify them prematurely by any system of analysis. Vocational guidance should be a continuous process designed to help the individual to choose, to plan his preparation for, to enter into, and to make progress in an occupation. At this point let us give some consideration to the need for vocational guidance. Industrialists throughout the country are beginning to realize that much of the unemployment of the past few years and many other social evils are due to the fact that persons now at work stumbled into their jobs without guidance. The shock of business failures has convinced industrial leaders that the misuse of human energy resulting from improper guidance will eventually close their establishments, unless corrected.

With a complex civilization have come bewildering subdivisions of occupations as well as a host of new ones until

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[15] Loc. cit.

we now have a grand total of 20,000 different categories of work. If we were to change positions or kinds of work every day including Sunday from birth, it would take us about fifty-five years to sample every variety of human labor. This statement helps us appreciate the need for guidance.

Mr. Goldstein[16] points out that there are twenty to twenty-five million workers who change jobs to enter others every year. This turnover represents tremendous waste in terms of time, money, and human energies. The cost of hiring and training an employee in supervision, spoilage of materials, and the like is approximately fifty dollars. This means a cost of one billion dollars a year because of such turnover. This is the bill for occupational maladjustment. Who foots the bill? Not the employer, but society. The employer raises prices to cover the overhead. Furthermore, delinquency, dependency, and mental disease, the step children of job instability, are the joint burden and responsibility of society in general and the community in particular.

There are several reasons, then, why there is at present such insistent demand for more definite provision for guidance. The satisfaction of this demand rests on the shoulders of the public and its agents: specifically, the teachers of our public schools. Arthur J. Jones in his book on Principles of

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16 Hyman Goldstein, "Today's Shifters, Tomorrow's Shirkers," Industrial Arts and Vocational Education, 27:14-15, January, 1938.

Guidance summarizes these reasons as follows:

1. Changed conditions of the home.
2. Changed conditions of labor and industry.
3. Changes in population.
4. Elimination from school.
5. Necessity from standpoint of society.[17]

What has been said here has been general. As industrial arts teachers we are concerned to know how we may assist in the important work of vocational guidance. We must admit that we have the advantage in guidance work because of the nature of our work. The student-teacher must remember that, like many academic teachers, we are likely to be guilty of teaching the subject rather than teaching the boy. Perhaps we should act on the principle, "I am not so much concerned with what the boy does to the board, but I am concerned with what the board does to the boy." This is our chief concern, and we will naturally avail ourselves of every opportunity to do some constructive work in guidance.

IV. OBSERVATIONS

Observation is here defined as the scientific scrutiny of the teaching act in the light of recognized educational principles. As a learning tool it has great value. Its use

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[17] Arthur J. Jones, Principles of Guidance (New York: McGraw-Hill Book Company, 1930), pp. 5-17.

in connection with theory and subject-matter courses and with student teaching may lead the student to a broader understanding and appreciation of the educative process than he can acquire in any other way. It is difficult to get as clear images through hearing or reading about the teaching act as through seeing it. Students may, however, waste much time and gain little from observation if it is not carefully directed. The critic-teacher or other instructor who makes use of observation as a learning tool must have in mind the purpose which it may serve.

The value of an observation depends upon the amount and kind of preparation preceding it and by its later evaluation. To the inexperienced student-teacher the work observed yields values in proportion to the student's attitude. Whether his attitude is properly set, depends upon his apperceptive background. A discussion before and after the lesson will be valuable in clarifying the observation. An acquaintance with the critic's long-view and daily plans, the goals to be attained, the critic's educational principles, and data concerning the pupil's background will aid the student to clarify the teaching-learning situation observed and will enable him to evaluate the experiences in the light of his own educational principles.

The following suggestion of a form for the observer is offered for the use of the student-teacher by H. L. Stiles.[18]

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[18] H. L. Stiles, "Form for the Observer," Industrial Arts and Vocational Education, 27:113, March, 1938.

Form for the Observer

Teacher . . . . . .
Class Observed . . . . . Date . . . . . .
Type of class procedure (Demonstration) . . . . . .
Name of Demonstration . . . . . .
Points Observed:

I. Starting the Class
   1. Was the teacher on time? . . . . . .
   2. Was the class started on time? . . . . .
   3. Did the teacher take the time of the class to call the roll? . . . . . .

II. Demonstration
   1. Are all the tools and materials ready? .
   2. Does the teacher proceed easily, skillfully, and without loss of time? . . . .
   3. Are all the students able to see what is taking place? . . . . . .
   4. Does the teacher have the attention of the class? . . . . . .
   5. Was the demonstration explained to the satisfaction of all the class? . . . . .
   6. How long did the demonstration take? . .
   7. Were all the students interested? . . . .
   8. Did the teacher secure the general participation of the class in asking questions? . . . . . .
   9. Was the questioning by the teacher skillfully done? . . . . . .

III. Teacher Personality
   1. Was the teacher sincere? . . . . . .
   2. Was he well prepared? . . . . . .
   3. Did he use good English? . . . . . .
   4. Did he speak plainly and convincingly? .
   5. Was the teacher enthusiastic? . . . . . .

IV. Special Notes: . . . . . .
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V. MODERN METHOD TRENDS

Use of instructional material. The time has come when we must make better use of the instructional material available. Many excellent sets of instruction sheets have been prepared

for industrial arts teaching by authorities in the field of industrial education. The beginning teacher will find it necessary to make revisions of these instruction sheets to make them satisfy his needs.

It is a certainty that textbooks will become an integral part of the teaching of the industrial arts work and should be selected with care and used in the best possible manner. The beginning teacher is often likely to try to teach without these valuable aids, but he will soon realize that they are necessary.

There should be a trend toward the presentation of more short lectures of informational value to pupils -- these lectures to be an accumulation of material which boys should know and in which they should be interested. In many cases, this type of lecture may be followed by passing out interesting data to be used as part of the notebooks kept for various areas. Notebooks should be for the purpose of assembling this material, rather than for copying any lectures given or any material placed on the board.

Visual aids of all types -- graphs, charts, slides, movies, magazines, posters, etc. -- have become an integral part of our instructional material. Many of these valuable aids are available to us free of charge. They will undoubtedly be more widely used as an educational method of instruction.

The excursion should become more a part of instructional material, but a class excursion is of little value unless it is a trip for a purpose, with a purpose, and with an outline, so

that the student has definite things to look for and definite things to find out. Otherwise, this trip becomes merely a matter of amusement with little value.

Another trend is in the direction of better plans for teaching shop work. We must be sure that our material is organized so that we know what we are teaching and why we are teaching, and how we are going to do the job. The student-teacher and the regular teacher would do well to remember at all times that good teaching is the result of good planning, not the result of unorganized activity.

Organization. With larger classes and more areas to be handled, shop organization becomes a paramount issue for every teacher. The teacher must set up some sort of functional organization that will make it possible for him to be a teacher rather than just a checker. Shop teaching takes place when the demonstration ceases and there must be time for the teacher to do this teaching job outside of routine duties.

There will doubtless be a trend toward better pupil personnel organization. The idea of organizing the general shop under a personnel plan of pupil direction is not a new one, but merely late in coming into widespread usage. Under this type of plan a shop foreman would be able to relieve the teacher of many routine duties. There is a suggestion that area foremen be responsible in turn to the shop foreman. Such a pupil-directed shop would undoubtedly make for a development

of leadership qualities in the students, and give the teacher more time to engage in the actual teaching processes. Such a plan must not be set up until the class has been educated to handle it. Specific and general duties will be assigned to each foreman. Each teacher will desire to formulate a plan and procedure to fit his own particular shop. In addition to presenting a list of duties to each foreman it is an excellent plan to prepare a wall chart for ready reference, giving a brief outline of the duties of each of the officers used in the shop organization.

Evaluation. There is a current trend toward better means of evaluation. It is doubtful that any of us have yet seen any entirely correct plan of evaluation in operation. There must be a trend toward better methods of evaluation, either through progress charts, methods of grading, testing, or some combination of these factors if we are going to have progress in industrial arts mean anything to either the student or the teacher.

Although much has been done, there is still a great need for standardized tests. Tests of some kind are necessary in order to encourage progress in learning and in teaching. Instead of thinking of tests as something made compulsory by a supervisor or principal, the teacher should see in measuring devices an opportunity to come closer to his students and himself.

Attitudes and habits. Good attitudes and habits are the result of method and not the result of content. Attitudes

and habits are ideas. Both of these ideas are difficult to evaluate, but they are the result of doing and thinking along certain lines.

Teachers in the field of industrial arts have a greater opportunity to develop right attitudes toward work and right habits of work than the teachers of any other subject in the entire curriculum. It must be recognized that these habits and attitudes will be the result of organization and method and not merely the result of just industrial arts work. In the future we will find ourselves spending more time with this idea uppermost in our minds so that we will know pupils are learning how to work with people and for people and are developing the right attitude toward work.

Projects. There is at present a distinct tendency to make projects of better design. We have a great opportunity to correlate art with industrial arts in our projects. The projects will be of simpler and more practical design. There is also a distinct trend toward more modern, but not modernistic, furniture. This plain, well-designed, modern furniture will be useful and functional in design.

A second tendency in this field is toward the making of smaller projects. In many cases it is possible to make smaller projects that require many fundamentals, use little material, and are within the ability of the student, but projects that still require great skill to make. These smaller projects will

probably require less shop equipment, and certainly less storage space will be needed. It is, of course, possible to reduce the size of the projects made and yet have projects more utilitarian, more valuable, more interesting, and more educational than some of those we have made in the past.

Another tendency is toward boy interest. We must choose projects which boys want to make and still follow any sequence of difficulty which we may have set up in terms of fundamentals to be covered in an area of work. It is possible that in connection with our shop work we have not thought enough about projects in terms of hobbies. In the first place, hobbies are the result of some interest developed either in or out of school, plus some ability to follow this interest with a fair degree of success. Hobbies are those things which one can't wait to do. They are things with which one is occupied during moments of leisure. Therefore, the hobby is an interest, and we must make it a part of our thinking in terms of industrial arts teaching.

Administration. Teachers now in the field know that more interest is now being shown in our work. This is the result of a great social-economic upheaval that was started before the outbreak of the war, but greatly accelerated by the advent of the war. It is an educational trend of utmost importance to the teacher of industrial arts. We do not delude ourselves by thinking that it is a trend which can be directly attributed to ourselves and

our fine work. This trend will cause administrators to want more of industrial arts work, and we as teachers will have to do more and more about seeing that the work fits in with ideas which administrators already have.

Administrators are going to be more concious of what we are doing now that they are more interested. They will want to know why we are teaching as we are, and they will watch our work closer in terms of results; but all of this should give us an opportunity to do some real good. If the teacher is doing his work as well as he knows how, he will welcome this close inspection and it will mean the promotion of our work even further than it is today.

CHAPTER VI

SUMMARY

Our industrial ability or our ability to construct in ever increasing quantity and quality is the pivot about which the success of our efforts toward the preservation of a democratic way of living hinges. Even the preservation of all the things which free people hold dear on this earth may be dependent upon the extent of our productive effort.

The burden for instructing this vast number of producers of these material things lies upon the shoulders of industry and upon the education made available in the public and special schools of our nation.

The industrial arts include the foundations in trades and industries which are essential to a useful education in our age. Since these arts are included in curricula of our regular schools and are recognized as of vital importance, teachers of these subjects must have special training in them as well as general training.

The suggestions in the foregoing chapters have been offered with the hope that they may provide a readily available guide toward furthering the preparation of student-teachers in industrial arts.

For many reasons, social, economic, regional, etc., the problem of teaching the industrial arts subjects presents a

real difficulty. Each area of the field of industrial arts is worthy of some consideration by every student. The author sincerely believes that the best method of presenting this work to all the students is the method of presentation now known rather generally as the comprehensive general-shop plan. The plan offers exploratory experiences in many phases of industrial work. The student may discover interests that will stimulate further study for permanent employment in industry.

An attempt has been made to define the problem and define the term comprehensive general shop. Good teaching criteria prevail in this field as in others. The author believes that a teacher has a greater opportunity in this field to do some real teaching, proposing of living habits and ideals, than in any other teaching field. Certain objectives of the student teaching in this field are those relating to any of the other teaching fields.

A rather thorough analysis of the teacher has been attempted. This analysis is concerned with other things than merely the subject presentation. Success is determined in large measure by the physical and mental health of the student-teacher. A workable philosophy of living is an essential. Adequate scholastic preparation is a matter of vital importance. The old adage that you can't teach what you do not know certainly applies, as does also an equally apt conclusion that the student-teacher must know a great deal more than he will be called upon

to teach. This applies not only to information in a special field but to general information as well. Of equal importance are individual characteristics which we may call personality. Often, with excellent scholastic background, a good personality, and excellent physical ability, the faculty of getting along with people is a determining factor in success. These factors have been indicated and some suggestions made for their attainment.

A discussion of each of several of the more important subject areas has been given. For each of these areas a very definite attempt has been made to give the student-teacher some accurate information regarding the offering, its requirements, possibilities, etc. It is hoped that the treatment of these areas may serve as a guide for the student-teacher's preparation of other areas as occasion demands.

Well-laid plans of instruction, teaching aids, and devices are of the utmost importance, and the administrative phases of the problem must not be minimized. Chapter IV offers some concrete suggestions dealing with the shop and its equipment. Careful planning of the shop and its facilities can add much to the success of the shop offerings. Realizing the importance of this phase of the problem, many very definite suggestions have been given covering the findings of others as well as the experience of the writer. It has well been said that good equipment and good layout of facilities constitute a solution of

half the teaching problems of industrial arts.

Several suggestions dealing with the best ways to provide silent instructional material are offered. Probably no one best method has yet been found. A combination of operation, information, and assignment sheets is probably best to date.

Attention has also been directed toward the problem of evaluation of pupil effort. As long as effort must be graded there should be some rather tangible directions for doing it. Caution as to the use of standardized tests and suggestions for their use as well as exclusion of dependence upon subjective phases of grading are indicated.

A brief discussion of such problems as safety, guidance, conferences, and observations was given. These considerations are of utmost importance to the student-teacher.

A forward look was made to serve as a guide for the teacher who is entering this great field. Many new trends were noted in the study, and implications were drawn for the teacher of the comprehensive general shop.

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