

A SUMMATION OF ARTICLES PERTAINING TO THE GENERAL SHOP PUBLISHED IN
THE INDUSTRIAL ARTS AND VOCATIONAL EDUCATION MAGAZINE

By

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CHAPTER I

THE PROBLEM AND SOURCE OF INFORMATION

Introduction: General shop is becoming more and more a part of the thinking of progressive educational leaders, especially of those interested in the instruction of the various types of industrial arts. Because of the flexibility and the varied qualities of the general shop, it has been recognized as one of the most suitable methods of instruction in the junior high school program. In recent years teachers, administrators and educational leaders have been looking to the general shop program for the solution of many of the educational problems relative to industrial arts.

Objectives of general shop are to provide exploratory experiences for the pupils, to create new avocational interests and to develop proper attitudes, habits and appreciations. The general shop is also considered valuable because it opens a natural medium for guidance, both educationally and vocationally.

A Statement of the Problem: The scope of this problem is the summarization of all articles pertaining to the general shop as reported in the Industrial Arts and Vocational Education magazine, from 1923 to 1951.

Purpose of the Problem: The purpose of this problem is to condense the articles concerning the subject of general shop as found in Industrial Arts and Vocational Education; so the reader may conveniently survey the origin, aims, content, methods and trends of the general shop.

Reason for Study: The reason for this study is twofold:

To present, in condensed form, a limited idea or concept of the general shop.

To organize the original writings so references to them could be made more conveniently in case the reader is interested in making a more detailed study of the subject.

Limitations of the Study. With the exception of some historical references, this study has been confined to the magazine Industrial Arts and Vocational Education. Only articles pertaining to any phase of general shop work have been included. There is repetition of information on some aspects of general shop, and on other aspects there is little reported. Those areas which were lacking in detailed information have not in any way been supplemented by the writer.

CHAPTER II

HISTORY OF MANUAL TRAINING

Ancient History. Since the beginning of time man has had a struggle to preserve his life. This was no small task in the case of the prehistoric man, for his duties were to provide food and shelter for his family and protection from the beasts and enemy. For many centuries progress was slow, the implements crude, and the methods few. As the centuries rolled on the search for methods of making the burden lighter continued. Little progress was made and the methods of work changed almost imperceptibly. Occasionally providence intervened. With the accidental discovery of fire new avenues were opened. More materials could now be used and new weapons made. With better implements with which to farm the land new and improved methods could be practiced. With the discovery of fire came the dawn of progress and with the discovery of metals and methods of working them a new era was born.

This information was passed on to future generations from father to son. To the son of this early age, education did not simply mean the learning of a single skill; his responsibilities were those of a farmer, blacksmith, warrior and peacemaker. All the responsibilities of the household were passed to his shoulders, and he had to learn all the processes which would help him to carry on these duties.

All through the ages the problem of how to make a livelihood has been of prime importance. This problem is one which has intrigued almost all of the common people, and therefore one which has always received consideration of the educational leaders. Long before the National Education Association formulated the seven cardinal principles, these principles were the guiding

post around which the educational leaders built their philosophies. Much credit is due to the early educational philosophers who were so keenly interested in the welfare of mankind. Because of them we today enjoy a well founded, well rounded and well organized educational program, with clearly defined objectives including all people and all races.

Writers refer to manual arts as far back as the renaissance, but documentary evidence of practical and useful education dates back almost 4,000 years. Stone tablets excavated at Ur of Chaldea revealed laws under which young people learned "how to do things." A great deal of what we now term the culture of the past grew out of the efforts of those skilled with their hands. King Solomon's temple was beautified and adorned by one who was regarded as the most skilled and accomplished artist of that time.

In the Jewish home, religion was an important duty and an important part of education. Even though the Jewish boys were expected to spend much time in the study of the law, an equal amount of time was spent in the learning of some trade. This education took place in the home.

In the early days of the Greeks, vocational education was not considered so important. Those who had to make their living by doing manual labor were looked down upon and were considered of little use to the State. Manual labor was considered an evil in that it destroyed the health and left no time to serve the State.

In the year 638 B. C., the Egyptian country was barren and unfruitful. The country people found it difficult to make a living and so there developed a movement of people from the country to the cities. Of necessity they found it imperative to learn a trade. This movement resulted in individualized trades.

One of the very first writers of this early age was More, and his main

writing was known as More's Utopia. In his writings he recommended that agriculture be taught in schools. Rabelais' Utopia recommended that various types of arts, wood carving, recreation and exercises be taught the people. In Campanella's City of the Sun he wrote of a city which was divided by seven walls. Each wall pictured various types of instruction, and one whole wall was given to instruction of arts and industry.

These early thinkers desired a more efficient organization of society through the construction of the commonwealth. The trend of the curriculum was toward manual arts. In More's writings, he is the first to suggest the combination of industrial education with the common school. Rabelais desired industrial education to satisfy the desires and interests of his pupils and to give them a knowledge of their surroundings, letting them taste of some of the rich variety of human experiences.

European History. In 1517, Martin Luther, an Augustinian friar teaching philosophy at the University of Wittenberg, criticized certain practices of the Church. Later he defied its authority and was excommunicated and made a prisoner. This marked the beginning of that historical period known as the Reformation.

At one time these European people were known for the purity of their family life and the free, dignified spirit of their individualism. For centuries, however, the Teutonic races were subjected to domination of Christian institutionalism. Under the stimulus of the Renaissance humanism they had been revitalized. These elements of physical vigor, mental alertness, moral zeal and free individualism imparted new power and direction to the lives of the northern peoples.

Luther was recognized as an educational leader as well as a religious reformer. It was his firm belief that it was the duty of the State, Church

and home to accomplish the task of educating the youth of the land. The curriculum consisted of moral, social, civic, vocational and domestic training.

Luther was also a firm believer in vocational training. He insisted that every boy and girl should learn the practical arts of trade and home. These subjects were not advocated as part of the school curriculum. "My idea," he said, "is that boys should spend an hour or two a day in school, and the rest of the time work at home, learn some trade and do whatever is desired." (13, page 290).

Luther believed that education ought to be for everyone. One of the principles set forth is that, since impressions are the basis of thought and consequently of knowledge, the second principle was learning by doing.

The early Christian monks also did much to promote the knowledge and learning of skills. For nearly two centuries each monastery was organized under its own system of rules, which varied widely; but in 523 the organization of community monasticism became definite and uniform with the formulation of the rules of Benedict. Benedict founded the monastery of Monte Cassino in Southern Italy and drew up a code of seventy-three articles which covered in detail the organization and administration of the monastery.

Benedictine was the founder of the Benedictine Order. Some of the arts developed by Benedictine were reading, printing and book-making. Later these monks became teachers of husbandry, art and literature. As the Benedictine Order grew, need for more buildings was realized. This problem was solved by the monks, for they did the building themselves. "Through the monasteries Europe acquired industrial skills and a concept of the true dignity of manual labor." (13, page 174).

X At the turn of the eighteenth century an outstanding educational

leader known as Pestalozzi came to the front. This educational leader had a keen sense of what should be taught in the common schools, having taken the teachings of Rousseau. He conducted several experimental schools. The objectives of these schools were a social reform. It was his purpose to put an end to the source of misery. A note of his philosophy is sounded in the following statement: "I lived like a beggar in order to learn how to make beggars live like men." (13, page 468).

A new era in the history of manual labor opened with the publication of Rousseau's Emile in 1762. In this book he told the story of how he would educate the boy Emile and why. He believed in individual freedom and expression.

Froebel was an outstanding educational leader of the nineteenth century. He received little formal educational training. At the age of seventeen he visited his brother who was studying medicine at the University of Jena. Here he was greatly impressed with the intellectual activity which centered about the institution and the new interest that was awakened in him at this time remained with him throughout the remainder of his life. At the age of twenty-four, after a careful study of the works of Rousseau, Basedow and Pestalozzi, Froebel opened an experimental school.

Froebel advanced a theory of self activity. His ideas of education were much the same as those of Pestalozzi. Froebel qualified himself to carry on this work. One of his most important works was his book known as The Education of Man. He was also credited with the beginning of kindergarten. Froebel's definition of education would fit well the definition of education today. Because of financial and political obstacles he was able to carry out only a few of his plans. However, his philosophies were sound and influenced greatly the educational leaders who followed. Froebel is

well known for his theory of Gifts and Occupations.

From almost the beginning of time one of the methods used in the teaching and promoting of the skills and knowledge of the various crafts was accomplished through the method of apprenticeship teaching. The apprenticeship method of transferring knowledge and skills can be traced back to earliest civilization. Fathers taught sons and mothers instructed daughters, and the elders of the tribes trained eager youth in arts and crafts. Greek and Roman history reveal that apprenticeship was a system practiced widely even through the dark ages. Apprenticeship teaching represented one of the only systematic methods of teaching. During the Renaissance period this method became a highly systematized and organized institution. The guilds were an outgrowth of the apprenticeship system.

Toward the end of the middle ages there developed, largely as a result of the Crusades, an increase in trade and commerce. This was also partly due to the growth of free cities and a new social class.

The Guild system was composed of the craftsmen of the citizens, and their objective was to promote the standards of their crafts. There were two distinct guild systems known as the merchant guilds and the crafts guilds. The merchant guilds flourished during the twelfth to the fourteenth centuries.

The only carefully organized education in the guild system was vocational training. The members of the guilds were divided into three classes: master, journeyman and apprentice. The apprentice worked for food, clothing and shelter, while the master was to give the apprentice instruction in reading, writing, religion, and morals, as well as to teach him a skill. The apprentice training usually lasted from five to seven years. The journeyman, unlike the apprentice, was free to work for the

various craftsmen and he received wages for his work. The master craftsman was the only one entitled to own a shop, buy raw material and sell manufactured goods. This method of training continued to exist until the industrial age gave growth to new demands for education.

Shortly before the industrial age came into being the teaching of apprentices was so abused that Louis XVI passed a law doing away with apprenticeships. As this reformation took place rather suddenly and there were no other organizations to take its place, much damage resulted to both the apprentice class and industry. This period was soon followed by the development of machinery and factories, so a new system of education was needed to take the place of apprenticeship.

The influence of these educational changes in Europe were soon felt among the ranks of the American education leaders and before long found its way into the American schools.

American History. Up to the opening years of the fifteenth century, wars and pilgrimages were practically the only influences which led people from one country to another.

About this time man discovered himself and the world about him. With the increased travel came the improvement of the miserable roads and bridges. One finds mentioned in all the early chronicles the expansion of the market and the rise of the craft guilds.

With the early traders sent out by the Spanish Crown came a number of Jesuits and Franciscans. These missionaries settled in Florida and Mexico. In documents written by these early missionaries and educational leaders it was mentioned that there were schools for all the trades.

The second group of people to make an impression on the American education system was a group of Moravian Missionaries. These people

pressed their way into the wilderness of North America and founded a school at Bethlehem, Pennsylvania, which now appears to have been a manual labor school.

With the peace of Paris began a series of persecutions which brought about the exodus, secretly and in small numbers, of numerous bands of Huguenots. Being much aware of the qualities of these emigrants as settlers, the English government provided transportation to America for a colony which, under the leadership of a popular preacher, gathered at Plymouth. In April, 1764, the emigrants reached Charleston, South Carolina, where after a short time they received permission to settle at New Bordeaux. Later on there drifted to the Colony the accomplished and eccentric Jean De La Howe. In 1796 he provided for the disposition of his fortune and as a part of this will he made plans for the founding and continuation of a manual labor school. Out of these humble beginnings came the various types of schools we have today.

Many of the early educational principles put into practice were ideas brought directly from European Countries. One of the first methods adapted extensively in America was the Apprenticeship system. In 1642 the Massachusetts Bay Colony passed a comprehensive apprenticeship law because there had been great neglect in the training of apprentices. Under this law parents and masters were obliged to train the youth in religion and capital laws and labor.

As early as 1674 the General Court of Massachusetts ordered that every town of fifty householders should appoint one within their number as a school teacher. Under this law many towns established free schools.

One of the earliest American educational leaders was Thomas Budd, who came to New Jersey from England in 1683. He proposed a scheme whereby every child, rich or poor, could learn the art, mystery or trade that he or she

delighted in. The Indians and their children were included in his plan. Later he wrote a treatise entitled Good Order Established in Pennsylvania and New Jersey in America. It was believed this writing had some influence in the establishing of the free schools.

In the year of 1778 a new and practical type of education was introduced at Cokebury College in Maryland. This new type of work included gardening and carpentry. The manual labor movement which started forty years later was believed to have found its beginning as a result of this College and the work it offered. A statement published by the College read as follows: "We prohibit play in the strongest terms, the employment, therefore, which we have chosen for the recreation of the students are such as are of greatest public utility." (3, page 92).

The founding of the General Society of Mechanics and Tradesmen of the City of New York was another milestone in the progress of vocational work as a part of the general educational program. This society opened an Apprentice Library in 1820. Because of the shortage of schools this Society of Mechanics developed a school which at first was attended only by the children of the members of the Society, but later it was attended by others.

The second and most famous of these mechanics institutes in America was the Franklin Institute of Philadelphia. The three following resolutions passed at its first public meeting indicate the original intent of its founders:

"Resolved, that it is expedient to form a society for the promotion of the useful arts in Philadelphia, by extending a knowledge of mechanical science to its members and others at a cheap rate.

Resolved, that the best mode of attaining this objective will be by the establishment of popular lectures, by the information of a Cabinet of models and minerals and of a Library, and by offering premiums on all useful improvements in the mechanic arts.

Resolved, that the Society shall consist of mechanic manufacturers and others friendly to the useful arts." (3, page 319).

One of the chief difficulties encountered in the Mechanical Institute was that those who attended the lectures did not have sufficient elementary education to understand the full scientific and mechanical meaning of the lectures. This resulted in the development of three year programs in which four important studies were offered—English, modern languages, classical studies, mathematics and sciences. It is clear that the institute sought to broaden secondary education, while holding fast to classical studies as producing the best demonstrated results. The school continued until 1832. By demonstrating the need for such a school, it prepared the way for schools that followed.

Some of the other schools opened during this period were: The Gardenier Lyceum, noted for its night classes; The New York House of Refuge; the Rensselaer School at Troy, New York; which was established to give instruction "in the application of science to the common purposes of life;" (3, page 350), and the Owens school at New Harmony, Indiana. Manual labor was instituted at Maine Wesleyan Seminary and manual labor was begun at Andover. This was considered one of the most successful manual labor experiments up to 1829.

The move to introduce manual labor was important because up to this time manual labor taught in schools had been considered solely as recreational, but at this time it became a regular part of the educational program and the goals set were to prepare the individual for better living.

Another school that followed at this time was the Oneida Institute, Whitesborough, New York. The opening of this Institute was promoted by a minister who believed that a combination of manual labor and study would promote better living and health. The experiment was so successful that in 1831 five hundred applications were made to the Institute which should

only accommodate sixty students. As a direct result of the Oneida Institute the Manual Labor Academy of Pennsylvania was established. It was different in the fact that the Oneida Institute consisted mainly of agriculture work, while the Manual Labor Academy offered courses in carpentry, gardening and farming.

The institutes which offered manual labor courses had become so popular that by 1829 many schools which up to that time had offered only academic training now began to offer manual labor training. The beginning of the manual labor movement is believed to have started when Fellenbergs Academy was founded. This movement began during the years 1825-1830. It reached its height about 1834 and in less than ten years had spent its force, but left a certain type of work which grew and became permanent.

On the 15th of June, 1831, there was held in Masonic Hall, New York City, a meeting called to consider the introduction of "manual labor into literary institutions as a system of exercise for students." (3, page 189). Several resolutions stating the values of manual training and why it should become a part of the regular educational program were passed at this meeting. A committee which had been appointed during this meeting called another meeting the following month, July, 1831, at New York. It was at this time that the Society for Promoting Manual Labor in Literary Institutions was formed and action was taken by appointing Theodore D. Weld, of the Oneida Institute, as general agent of the Society. The general object of the Society was to collect and diffuse information concerning the best methods of "uniting labor with study" in seminaries and schools of learning. It was admitted that the subject was but partially understood and that much of it rested in many minds "only as a pleasing theory." (3, page 190).

Between the years 1845-1853, drawing was introduced as a subject into

the schools. One of the first schools to adopt this new subject was the Philadelphia High School. A noted painter, Rembrandt Peale, had a desire to introduce this subject; and in order to accomplish his desire he secured a position, in 1840, to teach drawing three days a week in the Philadelphia High School. He prepared a book setting forth his methods. For two years Peale practiced his methods, and then offered to introduce, without charge, his system of drawing into grades below the level of high school. He met with so much opposition from those in authority that he finally resigned his teaching position. However the course continued to be taught with good results.

The first agriculture society on the American continent was the Philadelphia Society for Promoting Agriculture, organized in 1785. This was followed by the New York Society for the Promotion of Agriculture in 1791, and the Massachusetts Society for Promoting Agriculture in 1792. These were followed by many other similar organizations. There were two chief difficulties encountered in trying to establish an agriculture school. Farmers felt that those who studied agriculture in school were only book men. On the other hand, many educational leaders felt that the study of agriculture was not to be compared with the study of languages and literature.

In 1852 an effort was made to establish an agriculture college. At this time many noted statesmen and educational leaders were called together to give their view point, but no immediate action resulted. After much opposition and many failures, Justin S. Morrill, in 1857, introduced the bill for Land Grant Acts. By this action Morrill won the support of many friends, but the bill failed to pass the lower house. In 1859 it was again introduced and passed both houses, but was vetoed by President Buchanan.

The bill was again passed and signed by President Lincoln on July 2, 1862. Few colleges were established until after the Civil War when many states took advantage of the Land Grant Act.

Following the close of the Civil War many new discoveries of machinery and improvements in the methods of industry were made. This led to the industrial age, and with the coming of the industrial age new demands were again made on the educational program. In the year 1876, the Centennial Exposition at Philadelphia was held. At this time Dr. John D. Runkle, President of the Massachusetts Institute of Technology, was much impressed by an exhibition shown by the Russians on tool instruction. Dr. Runkle found here the answer to some of the problems he had been trying to solve. In writing about his experience at the Centennial he made the following comment:

"At Philadelphia in 1876, almost the first thing I saw was a small case containing three series of models—one of chipping and filing, one of forging, and one of machine woodwork. I saw at once they were not parts of machines, but simply graded models for teaching the manipulation in those arts. In an instant, the problem I had been seeking to solve was clear to my mind; a plain distinction between a mechanic art and its application in some special trade became apparent." (4, page 320).

Again he wrote:

"The method is not only educational, but it constitutes the only true and philosophical key to all instructional education. If we can formulate into an educational method the arts which apply in any particular industry, we have only to group about these arts courses such other subjects of study as obviously pertain to this industry to have a scheme which shall most surely and directly fit the student both in theory and practice to enter upon its pursuit." (4, page 321).

Upon Dr. Runkle's return to Boston in 1876, a new department was established at the Institute of Technology. Students of engineering would receive instruction in shop work and other professional students would be allowed to elect it. A new school was also recommended by Runkle in which

manual education would be the main subject. The purpose was to offer schooling for those who wished to enter upon industrial pursuits rather than to become scientific engineers.

After the courses had been established for some time, Hinkle made the following comment concerning the value of the shop work:

"This system of mechanic-art teaching is earnestly commended to all, with the assurance, that in the hand of competent and faithful teachers, it will prove entirely successful, not only educationally but also on economical grounds." (4, page 335).

Professor Calvin Woodward, in 1877, had caught a vision of a manual training school. His discovery was a result of the study of the Russian system. He saw the mechanic arts analyzed, pedagogically organized, and taught under the guidance of the same principles that have influenced methods of teaching the sciences, mathematics and even the languages. That same year a large building was secured and remodeled for the use of shop rooms. In this shop Woodward saw his vision materialize. The shops were well equipped—the basement was used for blacksmith work, the first floor was for machine shop and the second floor was for wood-working. The founding of the Manual Training School by Woodward, in the City of St. Louis, is considered as one of the earliest and most distinctive features of the manual training movement in America. This was the first high school in which manual training was taught. So complete was the organization and system of training that the school existed for several years without any noticeable changes.

The remarkable development which took place between 1880 to 1900 gave to manual training a permanent place in public education. At the close of the nineteenth century a new link was forged to add to the chain of progress of manual training. This was the introduction of the Sloyd system by

Gustof Larsson at Boston in 1888. The Sloyd training was intended primarily for teachers. During the first year progress was slow, but after 1891 it became necessary to limit the students entering the school, and preference was given to graduates of normal schools. At the end of twenty years, in 1912, the school had graduated 361 Sloyd teachers. Much of the success of this school is accredited to the dynamic leadership of Gustof Larsson. He believed that the essential qualifications in any teacher are: first, a proper understanding of and sympathy for the pupils; second, a professional training in the arts and methods of teaching; third, a mastery of the subject matter. (4, page 475).

An important action which encouraged the progress of vocational work was the inauguration of the Smith-Hughes program on February 23, 1917. From time to time this act has been supplemented by other acts. These acts have been authorized for the purpose of promoting and developing vocational work.

A more recent attempt to solve the problem of industrial training was to relate the school shop to the factory. From this action came four types of schools: the apprenticeship school, the cooperative school, the continuation school, and the evening school.

A later step taken to improve the industrial training was the appointment of a governmental commission to study and analyze the need for industrial training. In some schools part time work is encouraged, and Federal Aid is given for the instruction of various types of vocational instruction.

Since the close of World War I a new concept in shop work had gradually evolved from the traditional industrial arts program. It is the general shop idea and it has proved itself sound both educationally and psychologically. Educational leaders have found that many of the graduating students'

are being met in the general shop program. So successful has the general shop concept proved that educational leaders today are thinking more and more in terms of the general shop methods of instruction.

During the past few years rapid progress has been made in the development of the general shop. Surveys and research pertaining to the general shop have been limited but the results of what work has been done are encouraging.

In this twentieth century age industry is becoming more and more demanding. A broader knowledge of industry, its materials and methods, is essential to meet the needs of the complexity of the machinery and geared up assembly lines which await new labor. The general shop program is needed to pave the way to the door of opportunity for the youth of this day.

CHAPTER III

SUMMARY OF ARTICLES

The articles included in this chapter have been organized under four broad divisions. Some of the articles contained diverse information and have been placed under the heading which seemed most appropriate.

Part A. Content of the General Shop

The General Shop (11, page 244)

The idea of the general shop has been enjoying a wide spread popularity among school administrators. Manual training, as such, is no longer in good standing, and vocational training does not belong in junior high schools. Therefore, the general shop is hailed as the means by which a changed situation may be met. It is well to consider just what a general shop really is. The following is one point of view regarding the general shop.

The Detroit plan of industrial arts instruction is based on the use of a general shop. The shop room is simply a room equipped in a diversified manner. The subjects offered depend on such factors as space, equipment, community needs and the administration's policies and inclinations. The titles of such courses as household mechanics, general printing, general woodworking and general automobile mechanics are indicative of their scope and are limited only by tools, equipment, space, etc.

The general shop idea offers full opportunity for experimentation and research. The policy in Detroit is to provide a general shop which includes equipment pertinent to similar or related industrial units. The equipment is selected and arranged so it may be utilized by boys taking the courses

for which the shop was provided. The general shop has many advantages not offered by a unit shop. The possibilities for teaching organization is one of the many reasons that the general shop deserves considerable attention from persons interested in industrial arts education.

Study of Courses and Equipment of a General Metal Shop (40, page 47)

Early shops or factories usually consisted of a machine shop, blacksmith shop and foundry combined. The machinists were called upon to assist in the pouring of metal in the foundry unit. Even today we find general shops with the following combinations:

1. The village or small-town blacksmith shop is a combination of forge shop, welding shop and a crude machine shop.
2. The best garages of smaller towns usually are a combination of garage, forge shop, welding shop and machine shop.
3. The small contract shops in large cities are usually a combination of machine shop, welding shop, forge shop and a heat-treating shop.

The ideal order of rotating pupils through a general metal shop is to use sheet metal as a beginning course, followed by forging, machine shop, auto repair and foundry.

Outline of General Shop Courses (38, page 283)

The general shop program is designed for all ninth grade students. The class shall meet five times a week for a period of 45 minutes daily for twenty weeks (one semester). The student then continues for the second semester, during which time the operations and informational units in general shop will be progressively more difficult.

Course organization: General shop work in the first and second semesters is divided into five divisions--woodwork, sheet metal, bench metal, metal craft, and electricity. Students will be divided into five

groups, each group making at least two assigned projects in each division.

Class organization: In order to maintain a high standard of class discipline and organization a student foreman of each unit of instruction will be appointed along with a general shop superintendent. They will care for routine matters such as station cleanup, general safety factors, dispensing of supplies, keys, maintenance, etc. The student should not be allowed to take roll or enter grades on cards. No materials or supplies will be given without first consulting the instructor. All materials will be furnished free except the extra jobs done after core projects are completed.

General Methods of Instruction: At the beginning of each semester the instructor shall give related information concerning material with which the student will work. Notebooks will be used for taking notes and for making drawings. Drawings should be put on the board and copied by the pupils. Each student will receive guidance in each of the five units.

Pupil-Personnel Organization: Such organization not only permits the student to assume responsibility for the care and operation of the physical set-up, but also relieves the teacher of many routine matters, thus freeing him for more important tasks.

The following organization outline is mere suggestive and is offered as a guide to the beginning teacher.

General Shop Organization in General

1. The students will enter the shop and go immediately to their assigned benches. The safety foreman will unlock drawers and tool room, the tool boys will put on aprons and the general foreman will check the shop as to equipment, tool room and general condition.
2. After the tardy signal has sounded, roll call will be taken by the instructor and other preliminary matters taken care of.

3. While preliminary matters are being completed, pupils remove coats and sweaters, roll sleeves above elbows and put on aprons. They then line up in single file to check out necessary tools and proceed to work.
4. Five minutes before the dismissal bell the cleanup order shall be given by the instructor. The boys will then clean their respective stations, check in all tools received in their name, put aprons away in proper drawer and sit at desk assigned to them.

Special Assignments

The duties of the shop superintendent are:

1. Check shop for any irregularities as to cleanliness, proper arrangement of tools and equipment, missing tools, etc.
2. Assist supervision at cleanup period.
3. Keep an up-to-date list of unit foremen at all times.
4. Assist instructor in class supervision in the event of callers.
5. Set a good example of conduct for the rest of the class.
6. Be alert for violation of safety practices.

The duties of the foreman in charge of the various units are:

1. Keep up-to-date lists of boys working in his unit.
2. Be alert for violation of safety practices.
3. Make sure stations are clean at end of each period.
4. Make sure all tools are checked in tool room.
5. Report any missing tools or irregularities.
6. Dispense materials and supplies to his unit, making sure each item is first consented to by the instructor.
7. Set a good example of conduct to the rest of the class.

The duties of the safety foreman are:

1. Unlock drawers and tool room at beginning of period.
2. See that all boys are ready for work (sweaters removed, sleeves rolled up, etc.).
3. Light gas furnaces when necessary.
4. Watch for any boy who may work without an apron.
5. Be alert for violation of safety practices.
6. Apply simple first aid to injuries.
7. Check the first-aid cabinet every day for cleanliness and adequate supplies.
8. Keep soap containers filled and a supply of towels on rack.
9. Lock drawers at the end of period after all aprons and projects are put away.
10. Set a good example of conduct to rest of the class.

There will be two boys assigned to the tool room, one new boy each

Monday. The new boy is left in the room the whole period, cleaning, checking and repairing the tools. The other boy is there until rush is over and at the end of the period again.

Tool Checking Procedure

1. Boys will form a line on right side of door.
2. Each boy will write his name and tools he wishes to check out on pad issued for this purpose.
3. One tool boy will check list while the other gets the tools.
4. When returning tools each boy will lay them on the shelf until they are checked off by the tool boy. The second boy will return them to their proper places.
5. When all tools have been returned and checked, the check list will be placed on instructor's desk.

General Shop Projects

First Semester Course

Project

material

Doorstop	Pine 1 3/16 by 1 1/2 by 5 in.
Vice jaws	Pine 1 3/16 by 3 by 7 1/2 in.
Dividers	1/2 by 3/4 by 5 1/2 in. band iron
Hammer heads	1/2 by 1/2 by 4 1/4 in. square iron
Square scoop	1 C. tin (bright)
Cookie cutter	1 C. tin (bright)
Ash tray	26 ga. sheet steel
Bowl	26 ga. sheet copper--18 ga. 6 by 6 in.
Extension cord	Wire, plug, socket
Splices	No. 18 bell wire
Circuits	No. 18 bell wire

Second Semester Course

Mallet head	3 by 3 by 6 in. birch (square)
Mallet handle	3/4 by 1 by 10 in. birch
Calipers (inside)	1/8 by 3/4 by 5 1/2 in. band iron
Calipers (outside)	1/8 by 3/4 by 6 in. band iron
Metal box	26 ga. sheet metal
Spice scoop	1 C. tin (bright)

Extra Projects

Corner shelves	1/2 in. basswood
Window stick	3/4 in. basswood
Handkerchief box	1/2 in. basswood
Trowel	16 ga. sheet steel, 1/2 by 1/2 band iron
Lamp	1/2 by 3/4 in. band iron, 3/4 in. birch
Plaque	26 ga. sheet copper
Ring	No. 16 silver wire
Paper knife	16 ga. sheet copper

The General Shop Idea (2, page 205)

This article suggests that desirable traits of behavior may be developed in the pupil through participation in a good shop organization. The development of such traits as represented in the following situations should become an integral part of shop instruction: taking orders from a superior, giving orders to helpers, assuming responsibility for getting things done, participation in planning an organization, accepting duties for the good of the school.

The subject-matter content of industrial arts courses has undergone more radical changes in organization than in actual ingredient. There is a demand for general rather than narrow courses. If a pupil were to receive good training in as many of the "basic" processes as the time permits it would be reasonable to say that the pupil has a good "general" training. Emphasis should be given the idea that the number of "basic" things that can be taught in a "general" course is limited to the number of things that can be taught to the desired degree of attainment.

There are at least four industrial arts courses in the Detroit intermediate schools which may be classified as general shop courses. They are household mechanics, general woodworking, general metals work and auto mechanics. These courses are "general" in the sense that in each case the course content is organized into instructional units, each taken from

different trades.

A general shop may be defined as a shop in which a variety of stations or places to work are provided. Each station represents a workbench, a machine, or other suitable equipment for doing a specialized job. The general shop organization lends itself to the teaching of general industrial arts subjects because it permits the use of a variety of equipment which is made available for reducing and forming a variety of materials, and the accomplishment of many types of mechanical assemblies. Not only is this equipment available, but in the interest of efficient operation it is in use simultaneously. This means that one group of pupils will be using the electric station, another group the metal working station, and still another group the woodworking station. Each pupil will be working as an individual doing an individual job.

An Industrial Arts Experimental Shop (28, pages 101-102)

The new shops at the University of Missouri were completed in the summer and early fall of 1940, and were designed to serve three purposes:

1. Provide facilities for laboratory work on an experimental basis for students enrolled in certain professional courses.
2. Enable industrial arts teachers attending summer school to supplement their undergraduate training by acquiring, under supervision, new activities which may be introduced into their high school program.
3. Serve as a laboratory in which regular undergraduate courses in general may be conducted.

Those students who enroll in professional courses have the opportunity of trying out, testing and revising their programs before ever introducing them into the public school.

Another phase of this shop is to study the manipulation of newly developed industrial materials in order to determine their possibilities as media for industrial art activities, and to investigate new and inexpensive pieces of equipment. This shop was also designed to meet the expressed desires of the teachers who, because of the many activities in which they are engaged during the regular school year, are unable to learn the technical information, acquire the skills, and prepare the teaching materials necessary to create new activities in the general shop program.

These experimental laboratories were set up in rooms that represented poor conditions and were improved to the best possible extent. In this manner the students had an opportunity to see first hand what could be done in the way of remodeling and improving old shops.

The University of Missouri also developed a model planning center. The administrators felt that the importance of this area needed special attention. Even though the planning center is often recommended, it usually receives little attention.

Gearing the General Shop to War Needs (5, page 45)

The Navy plane quota was completed without seriously interfering with normal shop practice. Red Cross and other extra jobs are handled by our industrial practices class. This class is made up of advanced students, featuring four shop periods a week. Auto Mechanics and drafting are taught during a victory period.

Our general shop contains the following major units: tool cage, three woodworking lathes, variety molders, mortising machine, variety saw, 6 inch jointer, 30 inch band saw, foundry practice equipment, furnace, sheet metal bench, electrical bench, metalworking bench, three engine lathes, one

shaper, power hack saw, drill press and arbor press.

General shop courses:

Wood turning. Straight turning with live and dead centers, faceplate turning.

Foundry practice. Albany No. 1 sand, parting sand molding boards, sprue, flasks, hammers, spoons, leveler, wire for air holes, gate cutter, molder's brush, molder's bulb.

Patterns, wood and metal. Melting furnace, type metal. Lighting procedure.

Turn on air pressure first, then use lighting tube. To shut off, turn off the gas first, then turn off the air pressure.

Electrical work. Electrical circuits, diagrams, trouble lights, test boxes, sizes and type of wire, "BX" Cable, boxes, shop problem panels, flat-iron parts. War Department, "Fundamentals of Electricity."

Machine Shop practice. Soap or special hand protecting cream, engine lathes.

Shaper. Speeds, feeds, ram adjustments, tool post, cutting tools.

Drill press. Speeds, adjustments, accessories, chucks key, adapters, drills, reamers, grinding devices, lapping tools.

Micrometers, inside and outside. Frame, anvil, spindle, sleeve, thimble, dial indicators.

Machine woodworking. Variety saw, combination blade. Ripsaw blade. Set on teeth, hollow ground, height of blade, guards, slide, fence, pusher stick, accessories.

Jointer. Feeds, safety head, watch length of stock, safety devices.

Jig saw. Types of blades, saber sawing, accessories, speeds.

Band saw. Safe operation, guards.

Sander. Safe operation, belts, adjustments.

Portable drill. Safe operation, drill bits, other accessories.

The General Shop After the War (9, page 420)

The impact of the war on the entire field of education will without question have an important bearing on instructional content and instructional methods. Many who are engaged in industrial arts and vocational training believe that general shop will stand out more prominently as one of the devices to help both young and older men to prepare more efficiently for life's work.

Many years' experience has resulted in the general shop procedure as carried on at Dunwoody Industrial Institute. The twelve main departments fed by students from the general shop are: air conditioning, automobile, baking, building construction, drafting, electricity, general mechanics, highway construction, machine shop, printing, sheet metal, and welding.

The following objectives have been set for general shop: testing, review, trade tryout, advisement, orientation, related trades, readvisement and checkup on trade experience.

The general shop includes the following specific activities: automobile department, machine shop, electrical department, mechanical drafting, sheet metal, blacksmithing and general mechanics.

The staff of the general shop must possess considerable flexibility due to the fact that in the early fall and again on January 1st, very large incoming groups call for a very heavy staff. Later on, as the group of students are transferred or promoted to main shop, part of the staff used in the general shop travels along with the transferred student group. The general shop is also an excellent department to serve as a training center for the call staff and student assistants.

More About the General Shop (18, page 102)

During the years of rapid expansion of industrial arts the general shop has grown as a definite part of the whole program. A great deal of information is being assembled concerning various phases of the general shop. Comparative studies help to indicate progress and trends. The following is a condensed report of such a study.

The majority of indications point to the general shop as rendering its greatest service at the junior high school level and in the small schools.

A comparison of the origin of the shops shows that a slightly greater number had been reorganized from unit shops than were planned and established as new general shops. About half of the reorganized shops were under ten years old, and three-fourths of the new shops were in this age bracket.

The 127 general shop programs report a total of 54 different industrial arts experiences offered. Woodworking continues to be offered more frequently than any other area. Other prominent areas are mechanical drawing, wood finishing, sheet metal, and electricity. Bench metal, art metal and home mechanics appear in about half of the schools. Plastics is being offered with increasing popularity.

Half of the junior-senior high schools require industrial arts in grades 7, 8, 9 and 10. This may be a result influenced by the defense training program as no equivalent comparisons were found in current literature; or it may be additional evidence of the situation mentioned above.

Schools requiring industrial arts offer a selection of 29 separate experience areas. The twelve most frequently required are: woodworking, mechanical drawing, sheet metal, woodfinishing, bench metal, leathercraft, home mechanics, art metal, ornamental iron work, forging and machine shop.

The length of class periods ranges from 40 minutes to 120 minutes, with an average of about 60 minutes. There are a few cases where industrial arts classes do not meet daily. The most common variation is for the seventh, and eighth grade classes to alternate during the week.

Periods of less than 50 minutes are not as satisfactory when we consider the nature of the subject and the amount of time necessarily consumed at the beginning and the end of each period for the care of materials and equipment.

Another phase of time allotment is the amount of time scheduled for each required experience area within the course. The complete range reported was a minimum of five hours (one hour daily for one week) to a maximum of 180 hours (one hour daily for 36 weeks).

Seventy-two percent of the instructors reported using a definite rotation plan of some type, which indicates the importance of the procedure as a part of general shop organization. One plan of rotation is to require the student to complete a specific amount of work before he is eligible to start in another area. This method is used by 68 per cent of the classes as a whole. Another variation in the rotation process is that of rotating as a group or as individuals. Rotation in the general shop is a problem of the individual instructor to be solved for his particular shop situation.

Another specific problem is that of starting the class. The most frequently used method is that of demonstrating the beginning job in each experience area before the entire class and assigning the membership afterwards. This was rated first of the three best methods by all except the junior-senior high school instructors.

The second most commonly used method is to demonstrate the beginning job in a selected area and assign a group to it; then jobs for other areas

are demonstrated and pupils are assigned in a similar manner.

The third method makes generous use of instruction sheets. The pupils are assigned directly to the respective areas with written instructions; the instructor follows with demonstrations as the needs arise.

Developing a General Shop Course (43, page 104)

For this study the aims of the general shop are taken as follows:

1. To give direct experience and firsthand knowledge in the mechanical activities and devices of everyday life which make for social efficiency and economy and help to interpret intelligently the industrial world in which we live.
2. To develop in the student the power to do or accomplish things and to feel a pride in such accomplishments.
3. To appreciate the work of others and to have a joy in their success.

If this work is to interpret the industrial world, it is to the same industrial world that one must look for the subject matter. If the student is to appreciate the work of others and show a respectful attitude toward their skill, he must know their problem, their difficulty and basic processes. It was for this purpose that a study of the male occupations of the United States was made from the United States Census. The next step was to pick out occupations, information about which could be taught in the general shop, then condense the list to suit the community need. If in a farming country, the list of courses to be taught should include farm mechanics, etc.

Pattern Making and Foundry Work in the General Shop (34, pages 348-349)

One of the common units of work taught in the general shop is foundry and patternmaking. In order to teach this subject the shop must be prepared to present the material under the following three headings:

Tempering and preparing foundry sand.

Ramming a mold.

Pouring the casting.

Home Mechanics Instruction at Stout (7, pages 453-460)

The curriculum at Stout is offered on three levels to provide for a wide range of demands in the training of teachers. First, a two year course is offered which leads to a certificate; then a four year course is offered which leads to the B. S. degree; and lastly, a two year course is offered as intensive training to journeymen preparing to teach vocational work.

Some of the reasons for selecting this kind of work for the junior high school are listed:

1. This type of shop is a solution to the junior high philosophy.
2. It is a means of providing shop work for students in the junior high school.
3. It is a shop in which a variety of occupations may be represented in the school of the larger city where it does not seem feasible to have a number of single activity shops.
4. This shop is also being used in some places as the shop work for the part time pupils in the vocational school who come without any basis for making an intelligent choice for occupational work.

After making an analysis of the demands for various types of shop, this conclusion was reached—Home mechanics is coming to be interpreted as a course made up of a number of projects which are necessary in the mechanical maintenance of the home. The courses to be offered were developed by first considering the various occupations. These occupations were then analyzed; each occupation was divided into jobs; and the jobs were in turn broken into

steps and processes.

The subjects included in the course of study will clarify the study plan developed: woodworking, furniture repair, sharpening tools, bench metal, glazing and painting, sheet metal, plumbing, electrical work, and miscellaneous subjects such as leather, shoe repair, repair of inner tubes, repair of garden hose, replacing of handles in tools, cement work, adjusting gas burners, firing the furnace properly, and reading blue prints.

Before the shop can be equipped the courses to be offered will have to be studied and the various jobs determined so that the proper equipment may be secured.

Part B. Organization of the General Shop

General Shop Teaching (19, pages 286-287)

The determining factor as to the success of the general shop teacher is how well he is prepared to teach the general shop. The first class the teacher meets is undoubtedly the most important class of the year; for it is at this time that students form many conceptions which will characterize their action throughout the remainder of the year. Some of the considerations the teacher ought to give to this first class period are these:

1. Do not jump into the course.
2. Permit the students to form some pleasant impressions regarding their future work.
3. Take the students on a tour of the shop, explain the equipment and give them an idea of the work outlined for the coming year.
4. Permit the students to ask questions, examine tools, equipment and projects.
5. Be enthusiastic and explain how they will be rotated through the various units.

Blue print reading is essential and ought to be taught early. The methods used may be the blackboard, projection box, project models, and demonstration and uses of the mechanical drawing instruments. Orthographic projection should be explained and then the students should make a simple sketch on graph paper, using the orthographic projection method and layout. The sketch may be of something in the shop.

The teacher of the general shop should have good lesson plans and follow them closely. A familiar slogan is "Plan your work and work your plan."

General Shop Organization (25, pages 374-375)

The smoothness with which the shop operates will depend much on how well the shop is organized. One method used in shop organization is for the class to elect a foreman; in some cases an assistant foreman is also elected. The two foremen are responsible directly to the instructor, and they are made to feel the importance of this position. One clerk is appointed to each area or subject taught. The duties of the clerk are to check out tools, aid other students, check the roll, and appoint a librarian. These officers are appointed for the length of time they will spend in that particular area or subject, usually from two to six weeks.

It has been suggested that boys with the most ability be placed in these positions first. This gives the slower student a chance to observe and get acquainted with the duties of the various officers. By the time those slower students are elected they are able to accept their duties without any noticeable change in the organization.

The opportunity for leadership which the boys so eagerly assume and so wholeheartedly carry out is in itself a most outstanding feature of this organization.

The Eighty-Five Per Cent (1, pages 215-217)

Much has been written about the eighty-five per cent that have been prepared for college but for various reasons never get there. A survey was made by the National Youth Administration in which 25,000 unemployed youth, high school graduates representing all parts of the United States, were asked why they were most often turned down when seeking employment. The answer that came from the majority was because of the lack of practical experience, admitting that if they had taken shop work their chances would have been better.

Another survey was made of several graduating classes. The results showed that twenty per cent of the students entered higher institutions of learning; the remainder of the students lived in the community and worked at odd jobs. Further investigation showed that the training these students received was not adequate to prepare them for industry. As a result of a rather thorough investigation of what other schools were doing and an analysis of the needs, the following shops were developed: auto mechanics, metal shop, woodworking, graphic arts, electrical laboratory, and drawing. These shops were equipped with the newest and most practical equipment.

The results of this step are summed up in the Creed of The Progressive Educator:

"I believe in the common man.

I believe that education is primarily for the social well-being of democracy and not for individual benefit.

I believe also in the necessity of wide spread intelligence among all citizens.

I believe that a trained citizenry guided by trained, capable leaders is the life saver of democracy.

I believe that the main purpose of education in a democracy is the preparation of all its people for the duties and responsibilities of every grade of citizenship.

I believe that the ordinary man needs education as much as the superior man and that he is just as much entitled to it.

I believe education is primarily preparation for the duties of life, that it is life.

I believe that education is primarily training for thinking and doing things in some useful, social way.

I believe that there are many forms and kinds of education for training the interest and abilities of the many different kinds of people, all of whom are worthy of education.

I believe every one can and should be educated so that he can work for himself and society.

I believe that the educator is responsible both for the individual and the social results of his work.

I believe that education must be constantly adapted to the changing demands of life and should therefore never be dominated by tradition or by mere voice of authority."

Development of a General Shop Program for the Joliet Township High School
(14, page 361)

Prior to September, 1922, the Joliet Township High School maintained a manual training curriculum which paralleled the other elective curriculum of the school. One double period of shop work was provided daily during the four years, supplemented by an additional unit of drawing for one year.

In 1922 a program of vocational education, rather comprehensive in character, was introduced into the high school. The vocational program provided two and four year courses in trades. Both courses were strictly vocational and the boy spent all his shop time in one particular trade.

It was decided that all freshman boys should be required to take courses, and through experiences in several shops gain some understanding and get certain experiences which would help them in more wisely choosing their life work. The number of students to be provided for in the general shop course was about 150 the first year, and this has remained practically constant. During their freshman year the general shop boys are given a six week period in each of the six shops--plumbing, woodworking, painting, auto repair, machine shop, and electrical work.

The instructor is given full time to one kind of instruction. He is able to keep clearly in mind the objectives of the general shop course and to make a definite study of the boys in his group. Advantage is taken of

various opportunities to get information to the boys about trade or industry which cannot well be given in the shop or classroom by ordinary methods. At the close of the six week period each group is taken on a shop trip to a plant which is typical of the work just finished.

As a general proposition, the general shop courses have met with favor on the part of most of the boys and have furnished a means of providing understanding of the trade and industrial life of the community not previously obtained by these boys.

The Preparation of the General Shop Teacher (47, pages 93-94)

The general shop is one in which several activities may be conducted singly or simultaneously. The general shop teacher must be prepared for either method. He must be able to analyze teaching problems and should have organizing ability as far as teaching materials are concerned. His college work should include certain general and liberal arts subjects in order to preserve a balance between cultural and vocational subjects. The teacher should have certain professional subjects to insure the development of a professional attitude toward his work. Special work in his field should include subjects covering three or four fields, plus mechanical drawing. Trade experience outside of school in one or more fields should be an essential part of the teacher's training.

The general shop is in great need of adequately trained teachers, instructors of great initiative who have had a wide range of experiences in a variety of crafts, and teachers who can apply their skill in an elementary way in the construction of projects adapted to pupils of varying abilities and interests. The normal schools and colleges have not been able to cope with this new situation in supplying good shop teachers in sufficient numbers to meet the needs. As a result, many communities have not organized

their work on a general shop basis.

One of the greatest difficulties of the general shop is getting the classes started. Regardless of how well the teacher may know the material or how well he may handle the tools, the teacher must be a good organizer of lesson plans and materials. When the teacher has the ability to analyze the job and make a lesson plan with the instruction sheets and information sheets, this teacher is well on his way to being a successful general shop teacher.

Training General Shop Teachers (52, page 126)

In the teacher training division at Purdue University a course of work was offered on an extension basis which was to consist of tools and materials used in the construction of projects suitable to students of the seventh and eighth grades, reading and research relative to problems involved, and the preparation of individual lesson sheets which would be suitable to put in the hands of seventh and eighth grade students.

Three different kinds of work were undertaken each semester, with teachers who were specialists in that field.

Three types of lesson sheets were prepared:

Information sheets, giving the job and specifications.

Operation sheets, giving the order of procedure, operations and steps.

Job sheets, listing questions which help the student appraise and evaluate his work, and questions which test the information and operational side of his work.

General Shop Teachers of Illinois (8, pages 355-356)

The preparation of the shop teacher is a very important element in preparing to teach the general shop; for the teacher of the general shop does not specialize in one skill but must have a wide range of knowledge

from which to draw.

A survey was made in the state of Illinois to determine the amount of education for shop teachers and to what extent further education was being pursued. The study showed that there were many deficiencies. Some teachers had only a few hours of education while others had many. This was also true concerning vocational guidance and the sciences. Some of the teachers failed to meet the requirements of teaching woodwork, others electrical work, and some mechanical drawing.

Because of the short time an industrial arts teacher has to prepare for the purpose of teaching the general shop, the educational administrators are coming to believe that a fifth year ought to be added to the four years of regular college work. This fifth year would apply to the receiving of the masters degree. It was also felt that actual experience ought to play a more important part in the preparation of the shop teacher.

Some recommendations deemed advisable for change are as follows:

General shop teachers should be required to take a minimum of three courses in vocational guidance.

Industrial arts teachers should major in industrial arts both in the undergraduate and graduate levels.

At least two years of actual experience should be required of the general shop teachers in the various fields.

Admittance to high school courses should not be denied on the basis of sex.

General shop courses should be so organized that girls find the work profitable and interesting.

The unit of instruction should be chosen on the basis of modern industrial trends, local needs, abilities and interests.

The present general shop teacher must have more time for guidance in order

to help the student understand the basic framework of our industrial civilization.

Teaching Aids for the General Shop (26, pages 391-392)

The general shop courses present the problem of teaching a large number of widely differing kinds of work at the same time. This may seem a discouraging problem when contrasted with classes that can be kept together. However, it is actually quite easily solved.

The general shop is a laboratory which is equipped for doing several types of work, such as sheet metal or machine shop. The immediate purpose of a shop is to make the student able to perform certain tasks well and make them possessors of a certain fund of knowledge necessary or desirable in the performance of those tasks.

One aid used in making the teaching experiences more efficient is the use of notebooks. Another aid is the use of blackboard diagrams when demonstrating. Objective tests, including true-false, multiple choice and completion type questions, should be given two or three days after a demonstration.

Yet another aid used is the project board. Several hooks are placed across the top of the board with the names of the project to be taught above the hook. When the student is assigned a job he writes his name on a card as well as the name of the job and hangs it on the hook corresponding to that job. As soon as the project is completed the student gives his card to the teacher who in turn places a grade on the card and keeps it for future reference.

Point systems ought to be worked out for grading the important and less important projects. Another advantage of the project board is that a complete list of jobs is always before the student and creates a desire to complete all of them.

Visual Aids Quicken the Learning (48, pages 8-10)

The learning situation which brings into play the greatest number of senses is likely to be the most effective. We tend to learn more through the sense of sight than through any of the other senses.

A visual aid is any especially prepared device designed to facilitate learning through the sense of sight, and is used for the following purposes:

Increase the visual experiences of the student.

Strengthen vital images.

Give experiences not possible in the shop or class room.

Add variety to the students activities.

Reinforce learning.

Develop interest in some specific subject or activity.

Develop understanding of a subject in the shortest possible time.

Assist the slower student in learning.

Aid to other methods of instruction.

Characteristics of good visual aids are:

Large enough to be seen by all the class.

Important parts stand out, through use of color, cross hatching or shading.

Only essentials are included.

Used for instructional purposes, not for entertainment.

Lettering and notes clear, vocabulary with student understanding.

Portable, easily moved.

Made to scale, durable and strongly constructed.

Conforms to accepted technical practices in the field.

Types of visual aids are charts, blackboard illustrations, models, bulletin boards, sand tables, exhibits, film strips.

Visual aids may be made by the teachers or secured from Industrial Films,

Public Health Services, educational institutions, Department of War, Department of Interior, Department of Agriculture, Department of Commerce, and Treasury Department.

General Shop Courses for Rural Schools (51, pages 131-132)

General shopwork for the rural shop may be defined as such mechanical work as is commonly and economically done in homes and on farms with such tools and equipment as home owners have or find necessary to do the work. The courses embrace drawing, metals, electricity and farm mechanics. Home projects are utilized as they come in. The course lasts 36 weeks and by the end of 24 weeks all courses have been introduced. During the last 12 weeks students are permitted to specialize on any subject that particularly interest them.

General objectives are to discover or develop special interests, attitudes and habits such as leadership, organizing ability, analysis, orderly procedure, power of imagination, originality, initiative, accuracy in thought and expression, self-reliance, patience, perseverance, neatness, just pride in accomplishment, spirit of cooperation, obedience, punctuality, responsibility, service, adaptability, tolerance, courtesy, consideration of others, thrift, interest in and respect for home, school and community.

Courses offered may be drawing, sheet metal, electricity, hot and cold metal, concrete, harness, farm machinery.

Selecting General Shop Courses (53, pages 359-360)

The inauguration of a successful general shop program will depend to a large degree on the extent to which certain important factors are recognized and considered in the selection of the activities to be offered. No one will doubt the fact that the qualifications of the teacher must, of

necessity, be considered in the selection of activities of general shop; but this is only one factor and should not be the only factor considered. An intelligent selection of the activities to be offered in a general shop can be made only after all factors entering into the question are properly considered.

The following factors should be considered: community survey, nature of school system, number of pupils, grades to be accommodated, curriculum evaluation, program of vocational education, amount of money available, equipment, floor space, location of room to be used, availability of public utilities service, conference with school officials, conference with community leaders, possibilities of securing assistance from local organizations and industries, qualifications of teacher, occupational evaluation, elements of danger involved, boy interest evaluation, activity evaluation, aims and objectives and combinations of activities.

Fitting the General Shop to a Small Budget (32, pages 208-209)

There are many reasons which might be mentioned justifying the teaching of the general shop in any school, but one reason that might be of special interest to both teachers and supervisors is that the general shop can be fitted to a small budget. Expensive equipment and materials are not a necessity. Many subjects such as bell wiring, house wiring, soldering, cutting glass, glazing, lock setting, motor winding, radio, leather craft, metal craft, cold forging and concrete work could be offered.

In order to keep the cost low only enough equipment to permit two boys to work in each subject is purchased. The cost of the electrical department was \$4.00 for two bells, two buzzers, four push buttons, one transformer, bell wire and two wiring panels. Costs for units are low when handled

in this manner. Boys are encouraged to bring articles from home for repair and refinishing and to construct useful articles for the home.

General Shop for the Rural Schools (22, pages 49-54)

One outstanding factor of the general shop is that it can be adopted to almost any situation. Of all the schools that need the general shop, the rural schools perhaps need the general shop program more or as much as any type of school.

The objectives for the students of a general shop in a rural school are the use of all kinds of tools and the ability to keep household and garden tools and appliances in good order and good working condition. The student should also learn how to participate intelligently in the original planning of a house, how to keep the house and its premises clean and sanitary and how to protect the home from fire.

Building A General Shop Curriculum (50, pages 307-308)

The initial courses of the junior high level should be exploratory in content and should deal with a variety of processes and materials.

Sequence of Junior High Courses

Eighth Grade

First Quarter

- Group I. Woodworking handicraft unit, 9 weeks
- Group II. Leather handicraft unit, 5 weeks
- Linoleum block printing unit, 4 weeks

Second Quarter

- Group I. Leather handicraft unit, 5 weeks
- Linoleum block printing, 4 weeks
- Group II. Wood handicraft unit, 9 weeks

Third Quarter

- Group I. Bench working and carving unit, 9 weeks
- Group II. Tinwork unit, 4 weeks
- Plastics handicraft unit, 5 weeks

Fourth Quarter

- Group I. Tinwork Unit, 4 weeks

Plastics handicraft unit, 5 weeks
 Group II. Bench woodworking and wood carving unit, 9 weeks

Sequence of High School Courses

Ninth and Tenth Grades

Each alternate year.

First Quarter

Group I. Bench woodworking and wood carving unit, 9 weeks
 Group II. Leather handicraft unit, 4 weeks
 Plastic handicraft unit, 5 weeks

Second Quarter

Group I. Leather handicraft unit, 4 weeks
 Plastics handicraft unit, 5 weeks
 Group II. Bench woodworking and wood carving unit, 9 weeks.

Third Quarter

Group I. Blue print reading, mechanical drawing unit, 9 weeks
 Group II. Sheet metal unit, 5 weeks
 Electrical Unit, 4 weeks

Fourth Quarter

Group I. Sheet metal work unit, 5 weeks
 Electrical unit, 4 weeks
 Group II. Blue print reading, mechanical drawing unit, 9 weeks

Eleventh and Twelfth Grades

Each alternate year.

First Quarter

Group I. Leather handicraft unit, 5 weeks
 Plastics handicraft unit, 4 weeks
 Group II. Mechanical drawing unit, 9 weeks

Second Quarter

Group I. Mechanical drawing unit, 9 weeks
 Group II. Leather handicraft unit, 5 weeks
 Plastics handicraft unit, 4 weeks

Third Quarter

Group I. Bench woodworking and wood carving unit, 9 weeks
 Group II. Bench metal work and art metal craft unit, 9 weeks

Fourth Quarter

Group I. Bench metal work and art metal craft unit, 9 weeks
 Group II. Bench woodworking and wood carving unit, 9 weeks

General Metal Shop Organization (49, pages 141-143)

Each teacher ought to give some time and thought to organizing the general metal shop. General metal is popular because of its adaptability

to the industrial arts program and its low cost of maintenance; yet it provides for a wide range of activities.

The content of a general metal course would include machine shop, bench metal, welding, foundry, wrought iron work and art metal work.

In each area there are sufficient tools and equipment to do whatever jobs the students desire to undertake. In a shop of this kind the rotation system is used. Usually a definite plan for routing the students is determined so that exploratory experience and information result.

Electricity in the General Shop (27, pages 98-100)

Electricity is a popular unit in the general shop and rightly so. Where such shops are new or have not yet been started, the questions of cost, space and necessary supplies and equipment arise in the minds of teacher and administrators. The following information has been compiled from a survey made of 120 western schools:

Number of students taking electricity at one time 5 - 25
 Length of bench feet 6 - 48
 Area of floor space 40 - 1000
 Cost of new permanent equipment \$30 - \$200
 Cost of new tools \$15 - \$100
 Cost yearly of new tools and equipment \$5 - \$50
 Cost of new consumable materials to operate shop \$15 - \$100

Printing by General Shop Methods (10, pages 227-228)

Modern educators have developed the idea that education is primarily guidance. As yet, however, no method has been developed of successfully guiding a large group of students. The only practical method of instruction has been found to be the individual one. At the South High School, Youngstown,

Ohio, the scheme used primarily is a shop manual covering the essential steps in the production of printing matter that might be produced by the average class. The manual is divided into steps like copy writing, designing, typesetting, etc. An important step in the manual is the o. k. step. At definite points reached in the manual the student reports to the teacher for approval. This prevents the student from continuing with the job incorrectly. As each step is completed the number corresponding to the step is torn from the manual and pasted into his records. In this way the student can determine his own progress.

The greatest advantage in the general shop is the manner in which the teacher may guide the student along his natural ability. The teacher can with little difficulty observe the success or failure of the boy and can talk with him, advising him as to the trade, profession, commercial or artistic line for which he should prepare as a life work. Some folks have confused the problem, not realizing that a student's interest is not the same as his ability. No person needs to limit his field of interest to a particular field, though they may have greater success if they limit their activities to that field in which their particular ability lies.

The value to the student of such a thorough diagnosis of his abilities in the general shop, supplemented by advice as to his development, is such an outstanding advantage financially, physically and educationally that it seems the general shop is the first method of giving work which has real guidance value.

Part C. Planning of the General Shop

Toward the Ideal General Shop (16, pages 104-106)

While the concept of providing many exploratory activities with varied industrial materials and tools within a single shop started as an economy measure, the idea has progressed to a recognized status in the field of industrial arts education.

Considering the rapid changes which have taken place within our industrial economy and newer techniques which are evolving, it is realized that a great need for adaptability and versatility will be an increasing necessity in the future. Toward this end Finsterback designed an ideal general shop.

New General Industrial Arts Shop (36, pages 126-128)

The State Normal School at Brockport, New York, recently finished a new plant at a cost of more than \$1,250,000. One part of this new plant is the shop department. The shop consists of seven rooms and is so arranged that the instructor may observe workers from almost any position. Students work at benches along the wall and face the wall, which keeps the center wall clear. Acoustical installation materials are used to keep noise at a minimum. The department is practically fire proof.

Eleven basic units are taught, ranging from the fifth grade to college level. The shop is located close to the nurse's office to meet any emergency in case of accident.

All the tools are kept in metal cabinets which open on hinges and wheels. The equipment of each unit is grouped as closely together as possible. Electrically lighted cabinets and cases are used to display work done in the shop.

Your Course Has a Personality (23, pages 196-198)

The location and placement of equipment are important factors in planning a general shop. The author illustrated two floor plans in this article. One plan is rectangular, the other circular.

A Plan for the Small General Shop (20, pages 92-94)

A description of a new education plant planned by students and staff members is given by Chris H. Groveman, Professor of Industrial Education, School of Engineering, Texas Agricultural and Mechanical College.

The project is noted for its low cost of construction and features are the laboratory or shop area, equipment arrangement, color scheme, illumination and ventilation, student-teaching center and types of courses.

A Practical Approach to Shop and Laboratory Planning (15, pages 83-84)

When anticipating the building of a new general shop or the remodeling of an old building, several steps must be taken into consideration before the final architectural drawings are made. Some of the elements to be ascertained are: the kind and amount of equipment to be used; the placement of the equipment; the amount of floor space needed so that the students may work freely around the equipment and the location of an assembly area, storage rooms, tool rooms, and planning centers.

Professor Emanuel E. Ericson suggests that a model building be made to exact scale with equipment made to the same scale. By arranging the models in various ways an accurate idea of the placement of the equipment and the amount of floorspace needed may more easily be determined. Factors to be considered are: funds available; location of shop with reference to other buildings and rooms; outside entrance; provisions for browsing table or reference table; acoustical treatment; location of office or desk space;

seating area for the students; space for storing projects under construction and after completion; provisions for showing exhibits; place for painting and finishing; running water and facilities for washing; availability of compressed air; color scheme; bulletin board; master switch for machines; place for planning and designing.

Professor Ericson further suggests that this list be expanded to accommodate any future need. When a shop teacher goes to the trouble of making a model of the shop to be built, build scale model equipment for the shop, and offer suggestions other than general information; he will not have any difficulty gaining the attention of administrators and those who will be making the plans.

General Shop Planning Center (44, page 102)

The planning center may be looked upon as the hub around which the general shop revolves. The various units of work planned at this center keep the wheel of activity progressing at a more rapid speed than in the case of the shop without a well organized planning unit.

In order to include all conveniences in a unit, several problems need to be solved. The first is the location. This particular shop was located near the exit door because the library was close at hand, and from time to time students found it necessary to obtain reference books, such as Reader's Guide, which were not available in the shop library. This location placed the unit close to the teacher's desk and filing cabinets where records such as project cards, operation and progress charts, student folders and blueprints are filed or displayed. Also, the entire unit is on the opposite side of the room from the dust of the woodworking machine.

The amount of space was controlled by the number of books and magazines,

and the amount of drawing equipment. The size of the tracing unit was controlled by the size of frosted plate glass that could be secured at a low price. Sources of such glass are old office doors, house doors or show cases.

Combining the various units into one was accomplished by constructing a form of white pine 2x4's on which the bookshelves and the unit for holding the drawing boards and instruments were erected. Panels of five ply fir were used as the sides of the drawing equipment unit, for the doors to the storage compartment and for the top. The plate glass was frosted on one side and recessed flush with the top. When finished, the entire unit was painted steel gray and trimmed with royal blue.

A Practical General Shop Plan (33, pages 54-59)

Before the shop planning gets very far along the courses to be taught ought to be determined. Some of the subjects taught in general shop are: auto mechanics, electrical work, art metal, bench metal, sheet metal, welding, lathe work, forgery, bookbinding, ceramics, radio, concrete, drawing, foundry, painting, printing, woodworking, silk screen printing, photography, airplane mechanics, watch repair, lapidary, glazing, home mechanics.

The author suggested the floor be divided into four sections. Since woodworking and metal subjects require more room than the rest of the subjects added allowance should be made for them. Related subjects are grouped, and tools for each department are to be kept in their respective places and painted different colors to avoid mixing.

Industrial Arts Equipment List--Comprehensive General Shop (17, pages 204-211)

Many leaders in the field of general shop education are of the opinion that a good method of supplying tools or ordering tools for a particular department is to have a check list as a guide. The following lists of tools are those that would be used in the more common work areas.

Basic large equipment.

Benches, four pupil position.
 Benches, 19x24x33 high.
 Bench, foundry.
 Bench, sheet-metal stake type.
 Bench, electric or utility.
 Saw, 8 or 10 inch circular floor model.
 Drill press, floor model.
 Power grinder, pedestal model.
 Gas or cold forge.
 Pottery kiln.
 Textile looms.
 Screw cutting lathe, 9 inch, with accessories.
 Wood lathe with accessories.
 Jig saw with stand.
 Band saw floor model.
 Printing press with equipment.
 Planning table 72x34x30, linoleum top.
 Shop stools 20 inches high.
 Clay storage cupboards.
 Potter's wheel.
 Jointer, 6 inch.
 Filing case, letter size.
 Filing cabinet, five flat drawers over two legal size drawers, and base.
 Filing case card index.
 Air compressor, spraying unit.
 Rotary machine all-in-one.
 Squaring shears.
 Bar folder.
 Buffing Machine.

Equipment for metal work.

Jeweler's saw frames, 4 inch.	Chasing hammer, 1 in.
Tin snips, scroll pivoter.	Forming hammer, 10 oz.
Wire guage, U. S. Standard B. and S.	Dogwood mallet.
Soldering iron, 3/16 in. tips.	Anvils, various sizes.
Bunsen burner.	Hand drill.
Pliers, round nose, 6 in.	Pin vise, lowel type.
Pliers, needle nose, 6 in.	Crimping blocks.
Pliers, diagonal cutting, 5 in.	Plate molds, wooden 4 in.
Ball-peen hammer, 8 oz.	Plate molds, wooden 5 in.
Chasing tools.	Plate molds, wooden 6 in.
Background tools.	Hand brush.

Covered glass dish, for etching.
 Swiss-pattern files, 5 1/2 in.
 Crocus cloth.
 No. 3/0 steel wool.
 Clear lacquer.
 Lacquer thinner.
 Tripoli polishing compound.
 Liver and silver.
 Blanks, 1/2 by 6 in.

Pair of rubber gloves.
 Jeweler saw blades.
 Sheet copper, 36 guage.
 Sheet copper, 20 guage.
 Sheet brass, 20 guage.
 Metal etching mortant.
 Rough polishing compound.
 Blanks, silver, nickle, 16 guage.
 Black asphaltum.

Equipment for Ornamental Iron

Grinder, 1/2 h.p., 2 wheel, guarded stand.
 Gas furnace, combination.
 Bench anvil, 2 1/2 x 6 x 9.
 Floor anvil, 100 lbs.
 Wood anvil base, 16x16x24.
 Center punch.
 Flat file, 10 in. bastard cut.
 Half round file, 10 in. bastard cut.
 Half round file, 8 in. bastard cut.
 Round file, 8 in. bastard cut.
 File handles, 3-6 in. file, 6-10 in. file.
 Half-round file, 6 in. second cut.
 Round file, 6 in. second cut.
 Metalite cloth no. 100.
 Metalite cloth no. 120.
 Soft coal forge.
 Iron band, 1/16 x 1/2.
 Iron band, 1/8 x 5/8.
 Iron band, 1/4 x 1/4.
 Iron band, 3/16 x 3/4.
 Irons, black sheet, hot rolled 22 guage, 26 x 96 in.
 Angle iron, 1 x 1 x 1/8 in. 16 ft. long.
 Kasenit, case hardening compound.
 Bronze powder, gold, green, red.
 Steel, tool, 5/8 hexagon vanadium chisel stock.

Forge, hand blower with coal bin.
 Scroll bender.
 Machinist vice, swivel base, 4 in.
 Bending fork set. jaws.
 Iron workers hammer.
 Blacksmith hammer, 24 oz.
 Ball-peen hammer, 8 oz.
 Cold chisels, 3/8, 3/4, 1 in. edge.
 Tongs, straight tips, 20 in.
 Tongs, blacksmith's curved tips, 20 in.
 Anvil hardie, 1 7/8 bit.
 Cold cut hammer, 1 1/4 in. with handle.
 Power blower, three extra caps.
 Soap-stone crayons.
 Rivets, round head, 3/16 x 1/2.
 Rivets, flathead, 3/16 x 3/8.
 Rivets, round head, 1/8 x 1.
 Steel, tool, 3/8 hexagon vanadium
 chisel stock.

Equipment for metal turning and spinning

Spinning tools
 Special spinning toolrest, fit wood lathe.
 Screw plate.
 T handle tap wrench, 1/4 in. capacity.
 Drill and counter sink, 7/16-5/32 carbon
 steel.
 Combination square, 9 in., center head
 Drill guage, jobbers.
 Hammers, ball-peen, 16oz and 12 oz.
 Grinding wheel dresser.
 Crescent wrenches, 6 in. and 8 in.
 Files: 8 in. triangular second cut.
 8 in. square, second cut. 12 in. hand, double cut bastard. 12 in. flat,
 aluminum Macut. half round, bastard. 10 in. second cut. 10 in. smooth
 cut.

Ball, bearing tail center.
 12 in. tap, 1 in. diameter.
 Steel rules, 6 in.
 Micrometer caliper.
 Outside caliper.
 Dividers.
 Twist Drills, 1/16 to 1/2 by 64ths.
 Hack saw frames, blades.
 Oily waste can.
 Scribes.
 Monkey wrench, 10 in.
 File handles.

Equipment for automotive maintenance.

Auto motor, used, 4 or 6 cylinders.
 Gasoline motor, washer or lawn-mower motor.
 Model airplane motor, new.
 Stands for each of the above.
 Electric portable drill, 1/4 in. capacity.
 Grease gun, alcaite.
 Jack, hydraulic bumper lift.
 Pump, tire.
 Rim built wrench, four way.
 Socket wrenches.
 Spark plug wrench.
 Tire irons, curved.
 Pressure guage, tire heavy duty,
 Thickness guage.
 Wire brush.
 Dinging hammer.
 Magneto files, 2 1/2 in. blade.
 Drain plug wrench, male.
 Drain plug wrench, female.

Screw extractors.
 Spray gun.
 Tappet wrenches.
 Auto oiler.
 Battery filler.
 Tube testing tank.
 Battery and starter nut wrench.
 Mechanics creeper, 18 x 39 1/2.
 Valve grinding compound.
 Ignition wrenches.
 Valve lifter.
 Valve grinder.
 Hot patch outfit.
 Engine cleaning brush.
 Vixon files, 12 in.
 Flat file holder.
 Fender bumping hammer.
 General purpose dolly.

Equipment for foundry.

Flask, 6 x 8 x 2 1/4 cope and drag type.
 Flask, 9 x 12 x 4 in. cope and drag type.
 Trowel, square 1 1/4 in. wide, foundry tool.
 Spoon and gate cutter, 1 in. wide foundry tool.
 Lifter, 1/8 x 12 in. foundry tool.
 Taper and leaf, 1 in. wide foundry tool.
 Hammer, 3 1/2 x 14 in. maple wood.
 Ladle, bottom pour with sleeve, Rowell 6.
 Ladle, bottom pour with sleeve, Rowell 5.
 Sprue cutter, 5/8 x 10 in.
 Small rubber sponge, 4 oz.
 Molders bellows, 8 in.
 Riddle, 16 mesh, 18 in. dia.
 Melting ladle, 3 in. bowl.
 Safety goggles.
 Foundry leggings, fire resistant, duck-spring grip.
 Asbestos gloves, gauntlet type.
 Foundry bench.

Equipment for sheet metal.

Hand brake.
 Tinner's setting hammer, 12 oz.
 Tinner's riveting hammer, 12 oz.
 Tinner's wallet, wood.
 Steel rule, 12 in.
 Steel square, 12 in. body, 8 in. tongue.
 Revolving stake holder.
 Square stake.
 Needle case stake.
 Marking guage.
 Hand groover, 7/32 in.

Tin snips, 2 1/2 in.
 End cutting Nippers.
 Prick punch.
 Thin, straight-nosed pliers.
 Lineman's pliers, 6 in.
 Marking guage.
 Plumbers scraper.
 Soldering coppers.
 Soldering coppers handles.
 Rivet set no. 1, 2, 3.
 Solid punch, no. 6, 7, 8, 9, 10.

Wing dividers, 10 in. length.
 Compound lever shear, 7 in.
 Tinner's circumference rule.
 Hollow punch, Pexte, 3/8 in. dia.
 Hollow punch, Pexte, 1 in. dia.
 Handy seamer.
 Breakhorn stake.
 Creasing stake.

Equipment for plumbing.

Water closet flush tank.
 Compressor faucet, plain 1/2 in.
 Fuller faucet, plain 1/2 in.
 Pipe dies, ratchet type, 1/8, 1/4, 3/8, 1/2, 3/4, and 1 in.
 Vice, pipe, no. 2.
 Wrench, pipe, 8 in., 14 in.
 Wrench, monkey, 15 in.
 Bibb reseater.
 Brass hose couplings, 5/8 in.
 Brass hose clamps, 5/8 in.

Equipment for electricity.

Motor, 1/4 h.p. propulsion, induction 110 volts.	
Auto generator, d.c., 6-14 volts.	
Auto storage battery, 6 volts.	
Battery charger, three cell tungar type, 5 amp. delivery.	
Bell transformer, 4-24 volts, signal type 100 V. A.	
Radio antenna, insulators, lead in and lighting arresters.	
Lodestone.	
Magnetic compass.	Earphones.
Bar magnet.	Telephone set.
Horseshoe magnet.	Electric eye set.
Electric train set.	A. C. radio.
Bells.	Auto headlights.
Bussers.	Auto voltage regulator.
Heater units, screw type.	Auto fuse block.
Crystal Radio set.	Auto generator cutout.
Keyless sockets.	Key sockets.
Pull chain sockets.	Millimeter.
Weather proof sockets.	Milliammeter.
Insulated socket-porcelain pull chain.	Voltmeter a.c.
Ammeter d.c.	Voltmeter d.c.
Ammeter a.c.	Standard electric iron.
Standard electric reflector heater.	Electric fan, 8 in.
Electric door opener, magnet type.	Series christmas tree lights.
Plating bath.	Parallel christmas tree lights.
Push buttons.	Auto horn, magnetic.
Toy motors.	Auto horn, motor type.
Electric clock.	High voltage induction type cell.
Fluorescent lamp.	Battery hydrometer.
Miniature lamp bases.	Battery knife switch, single pole
Friction tape.	Roll splicing compound.

Dry cells.
 Wire, plain magnet no. 22 enamel.
 Miniature light bulbs, (flash light type)
 Fahnestock clips.

Coils of annunciator wire.
 Fuse plugs.
 Parallel lamp cord no. 18.

Equipment for ceramics.

Potter's kick wheel.
 Electric kiln.
 Clay storage cupboard.
 Metal sieve, 120 mesh, 8 in. dia.
 Metal sieve, 80 mesh, 8 in. dia.
 Mortar and pestle, 16 oz. wedgewood.
 Crocks, 2 gal. glazed, inside and out.
 Jars, 1/2 pt. glass, pressure type cover.
 Jars, 1 qt. size, glass, with screw type covers.
 Pans.
 Bench whirler.
 Wedging board.
 Modeling bats to fit 6 in. bench whirler.
 General storage cupboard, 18 x 36 x 38 high.
 Camel hair brushes.
 Modeling tool nos. 4, 5, 9, 12.
 Finishing rubber.
 Elephant ear sponge.
 Turning tools, left and right.
 Tile setters.
 Shelf supports.
 Kiln shelf.
 Knives, mold makers.
 Spatula.
 Kiln wash.
 Pycometer, cones nos. 04, 05, 06, 12.
 Clay, buff, red, terra cotta, in tubes.
 Plaster of paris.
 Grog.
 Saddle stilts.
 Double pointed stilts.
 Separator.
 1 set majolica glazed samples.
 Grylby glazed samples.
 1 lb. each of white, blue, chocolate brown, salmon, chinese yellow majolica glazes.
 1 lb. each of the low fire glazes 012, black, grey, turquoise, dark green, scarlet.

Equipment for woodwork.

Jack Planes.
 Nail hammers, 13 oz., 16 oz.
 Wing dividers, 10 in.
 T bevel, 10 in.
 Backsaws.
 Coping saws.

Block Planes.
 Try square, 6 in.
 Marking guages.
 Handsaws, crosscuts, 26 in., 10 point.
 Handsaws, rip cut, 26 in., 6 point.
 Brace, 10 in.

Augur bits, 13 bits. 1/4 - 1 in.	Wood chisels, 1 set.
Augur bit guage.	Mallets, wood.
Expansion bit.	Wood scraper.
Counter sinks, rosehead 5/8.	Rasp, half round 12 in.
Draw knife.	Files, half round cabinet, 12 in.
Spokeshave no. 51, 55	Nail sets, assorted.
Screw drivers, 4 in., 6 in., 8 in.	Level, 26 in.
Screw driver bit 5/16, 3/8, 1/2 in.	Counter dusters, 9 in.
I 4 bar clamps, 4 ft.	Augur bit files.
C clamps 6 in.	Oilers.
Carborundum stones double face.	Putty knife.
Compass saw.	Dowel jig.
Key saw.	Hand drill.
Keyhole saw.	Carving tools.
Sloyd knife.	Bench rule, 12 in. steel.
1 set of wood turning tools.	Bench rule, 24 in.
Shrink rule, boxwood.	C clamps, 4 in.
Calipers, firm joint.	Steel square, 24 in.
Rule, push-pull, flexible.	Fore plane.
Mitre box and saw.	Router plane.
Carving tool, slip stone.	Glass cutter.
Carborundum slip stone, medium grit.	Burnisher.
Saw set.	
Saw clamp.	
Saw files.	

Much of the equipment listed may be used on different types of metal so this equipment is listed only once.

In making up a shop list, especially for the purpose of checking equipment, the alphabetical arrangement may be used, or a grouping according to the unit in which it will be used.

It would be almost impossible to list all materials and equipment that might be used in various shops, and a check list should leave room for expansion.

Part D. Testing, Guidance and Safety in the General Shop

Testing in the General Shop (35, pages 62-63)

Since the general shop is or should be the first stepping stone in a student's vocational or technical planned course, it is very important that he get singularly well informed about tools and materials as early as possible.

In order to achieve this objective tests such as true-false, completion, multiple choice and matching are used. After the tests have been given the students exchange papers. The instructor reads the questions or each student reads one, gives the correct answer and also explains just what each term means so that the class may see and understand clearly just how this related information applies to their shop work. The attention that students give while these test questions are explained is very gratifying.

Tests are given early in the course. About the middle of the semester the same tests are given again. This time grades are recorded in the class book. The following percentages have been found to work out satisfactorily: A, 90-100; B, 80-90; C, 60-75; D, 45-55; F, under 45.

The purposes of the test are:

1. To find out how much the students know in order that the instructor may know how to teach them.
2. To provide student record sheets for all classes as a source from which a special class could be organized.
3. To check the instructor. If a large number of pupils fail the test it might be an indication that the instructor had fallen down on the job.
4. To determine pupils marks. A valid and comprehensive test should be a very good measure for pupils' marks.
5. To compare the results obtained from one class with the results of similar classes in the same or other schools.
6. To motivate pupil effort.

Test for the General Shop (6, pages 63-69)

In an industrial background test embracing textiles, electricity, pottery, cabinetmaking, designing, drafting, patternmaking, foundry,

machine shop practice and sheet metal work, 100 statements were given, some true, some false. One per cent was deducted for each statement answered incorrectly.

Examples of statements under textiles industry:

1. Most of the textile industries are in Ohio and Pennsylvania.
2. Most of the workers in the textile industry are classed as unskilled employees.
3. The four principal fibers used in the manufacture of textiles are cotton, flax, wool and silk.

Examples of the statements under electrical industry:

4. There is a large and growing demand for electrical workers.
5. A knowledge of mechanical drawing and practical mathematics is of help to the inside wireman.

Examples of statements under pottery:

6. Glaze on porcelain appears to be entirely distinct from the body.
7. Clay slip is used to fasten handles, knobs and appendages.

Examples of statements under furniture and cabinetmaking:

8. Today machinery is the predominating feature in furniture making.
9. Most of the work done in a factory may be classed as skilled labor.

General Shop Prognostic Test (24, pages 168-170)

Section I.

Directions: Place circle around correct answer.

1. Is a claw hammer a common tool in metalwork? yes no
2. A working drawing may consist of 1, 2, 3 or even yes no
more views.
3. To saw with the grain of the wood use a rip saw. yes no

6. A jackplane is a large machine power planer. yes no
8. On a woodworking chisel the level is on both sides. yes no
13. To anneal copper, it must be heated. yes no
21. Snips are used for cutting sheet metal. yes no
27. Electricity may be produced by ruffing one object yes no
on another.
29. No. 28 magnet wire is smaller than no. 20. yes no
34. A hydrometer is used in testing altitude. yes no

Section II.

Direction: Complete each of the following statements with only one of the numbered expressions.

36. The storage battery in the average automobile delivers current at a pressure of _____. (a) 4 volts, (b) 3 volts, (c) 6 volts, (d) 10 volts.
38. Gasoline is mixed with air in the _____. (a) cylinder block, (b) tank, (c) carbureter, (d) transmission.
41. The power developed by the exploding gasoline is transmitted to the crankshaft by the _____. (a) fan, (b) pistons, (c) generator, (d) transmission.

Section III.

Directions: In the blank space write the letter of the word related to the word in the numbered column.

- | | | |
|---------------------|-------|-----------------|
| 42. First aid | _____ | a. typewriter |
| 43. Open grain wood | _____ | b. Johnsons |
| 44. Shellac | _____ | c. paste filler |
| 45. Underwood | _____ | d. alcohol |

The General Shop as a Junior High School Activity (29, pages 171-173)

Perhaps one of the greatest values that can be attributed to the general shop is the part that it plays in guidance. One of the first problems a

student of the general shop has to solve is the making of a choice of the work he wants to do. Boys and girls are interested in their vocations even at this early age. The guidance values resulting from the general shop more closely fulfill the aims of general education than any other type of shop.

The objectives of the general shop program are as follows:

Exploration and guidance.

Retention of pupils.

Economy of time.

Recognition.

Provide better teaching.

Special provisions for adolescent pupils.

Better articulation with high school work.

Advantages of the general shop are many. One advantage is that it offers exploratory experiences. The student comes in contact with many different kinds of tools, materials, and processes, and has the opportunity of trying his hand at the manipulation of tools and machines. He has a chance to try his skill and abilities at those jobs that are of special interest to him. This places him in a better position to make a choice concerning the type of work he would most like to do.

It is good if the individual student feels that he is an active part of the educational process. This may be accomplished by permitting the pupil to choose part of all of his projects. The teacher, if skillful, may direct the student to choose something for which there is a real need. Students are sometimes directed to investigate the needs of repairs around the home. This usually includes projects or repairs which may be brought to school.

The General Shop as a Junior High School Activity (30, pages 266-267)

There should be exercises to give practice in the principles and their application. As an illustration, the mortise-and-tenon joint in woodworking

is one phase. The joint can be taught by having the student make such joints out of scrap wood merely as exercise until he has acquired the necessary skill.

In doing a project the student's immediate aim is the finished project. The interest is increased as the project comes nearer to completion. That interest in seeing the finished project does away with the drudgery of the process.

The production method gives the pupil an idea of how the work of a trade is carried on under trade conditions and is therefore more exploratory. As to the interest, it is safe to say it would be high so long as the idea of a play factory has its appeal.

The General Shop as a Junior High School Activity (31, pages 207-208)

The teacher for general shop should have unlimited resourcefulness, initiative and enthusiasm. He must have broad mechanical training, with ability to acquire more in any field as the occasion demands.

Guidance Values of Vocational Information and Exploratory Activities (39, pages 325-327)

The aims of the general shop program in relation to guidance are: vocational interests, vocational aptitudes and abilities, and the student's physical fitness for a particular vocation.

It is essential that potential abilities and interests be guided into the proper channels. Properly used they mean economic efficiency; improperly used they mean wasted talents.

Another aim is to provide vocational information. This may be accomplished in two ways: First, by giving to the students first hand information concerning the existing conditions of factory life and the requirements that students must meet in order to enter industry; and second, by

providing exploratory activities so that the student may gain first hand knowledge pertaining to the various occupations. These may be supplemented by visits to different industries and shops and by having visiting guest speakers from the various occupations.

Certain personal qualifications that have vocational significance should be noted: manipulative and muscular control, mental ability, patience and accuracy, visualization, ability to present opinions, leadership and artistic talent.

The value of exploratory activities lies in the fact that they reveal aptitudes and talents. Exploratory activities, if they are to serve best, must be set up in the school vocational environment. This may be obtained in part by organizing related occupations into groups and offering the instruction accordingly.

All teachers are counselors and should have information about the occupations related to their special subjects. Teachers of occupations and exploratory activities should possess an extended range of vocational information and understand the technique of using it to the advantage of the students.

General Shop Safety Instruction (12, pages 21-23)

One teacher used for his slogan, "I am to return the boy to his parents in a better condition physically and mentally than he was submitted to me." This teacher made it a practice to give one hour at the beginning of each semester to the instruction of shop safety, then emphasize and re-emphasize safety each time there was an opportunity.

The instructor ought frequently to call the students attention to the dangers of the shop. Care ought to be exercised with the handling and

placing of sharp edged tools.

On entering the shop students should remove coats, roll up sleeves and remove necktie. An apron, tied in back is worn. Students should be cautioned never to run in the shop and should be introduced to each machine with its dangers and hazards pointed out. If the student is aware of the dangers many of the accidents can be avoided.

Safety in the School Shop (46, pages 384-385)

In order to bring about a more workmanlike attitude among the shop students, and to have them appreciate the tools, materials, equipment and opportunities that are given to you in the shop, teachers ask students to subscribe to the following rules and regulations governing the shop. Almost all of the accidents are avoidable.

1. Always assume a workman like attitude in the shop.
2. Always treat all wires as live wires, until your instructor or you have made sure they are dead.
3. Have all your circuits checked before you throw in a feed switch.
Remember that an a.c. meter may be wrecked on d.c. current.
4. Do not use broken tools or equipment as they may cause damage to yourself or fellow workmen.
5. Follow the electric code as strictly as possible, remembering that serious accidents may result otherwise.
6. Do not attempt any circuit or hookup unfamiliar to you unless given permission to do so.
7. Attend strictly to your own work.
8. Remember that equipment has been loaned to you, and that you are expected to return it in good condition.
9. More than one boy working at a lathe, grinder or drill press at the

same time creates a hazardous situation and will not be allowed.

10. Remember to fasten all work securely in the vise, or press table, before starting the drill.
11. Do not use the grinder without permission.
12. Follow your instructors advice as to the proper use of all the sharp edged tools such as knives, chisels and plane irons.
13. Use care in handling dry cells and storage batteries, acid burns may prove harmful to you and your clothing.

A small card could be made for the students to sign, stating they had read the shop rules and would abide by them.

Safety in the School Shop (21, pages 125-126)

The old slogan goes "An ounce of prevention is worth a pound of cure." It may be old and homely, but it contains good sound logic and truth. Never before has there existed an age where precaution was so urgent as today in this highly mechanized era. The shop can be a very hazardous place if the proper precautions are not taken. According to the National Safety Council, the indications of the sharp rise in accidents beginning at the seventh grades through high school, where varied activities are offered, shows that the gymnasium and the shops are two of the danger points. Twenty per cent of the accidents in schools are attributed to the shops.

Safety practices are:

The aisles should always be kept clear.

Everyone should know where the fire extinguishers are located.

Oily waste should not be permitted to accumulate.

Materials should not be piled too high, there is danger of falling.

Goggles should always be worn when there is a danger to the eyes.

All accidents or injuries should be taken care of at the infirmary immediately.

CHAPTER IV

SUMMARY

A careful study of the history and development of industrial arts indicates that the general shop is rapidly becoming an important phase of the shop program. The general shop idea has developed primarily since World War I. Undoubtedly it is best suited to the junior high school level and is being taught all over the United States on that level because of its flexibility and exploratory nature.

The general shop is a shop equipped to teach more than one subject at the same time under one teacher. Its chief purpose is to provide exploratory experiences and industrial information.

The content of general shop is representative of modern industry. Common types of general shop subjects are plastics, ceramics, leather, electricity, ornamental iron and woodworking. Courses of study depend upon the grade level, type of school and the objectives of courses being offered.

There are many advantages in the general shop. It is easily adapted to the industrial arts curriculum, permits more individual freedom in regard to interests and capacities, enables students to discover their abilities, and is an economical way to furnish experience in many fields. It makes possible an adequate industrial arts program for a small school, stimulates the planning of a well organized shop and increases the teacher's efficiency.

General shop gives students a wide range of experiences and a chance to try their skills in manipulating tools and materials. Because of the wide variation of interests and capacities of students, the general shop

is more apt to meet the needs of students who would otherwise receive no shop experiences.

In planning the general shop, certain requirements must be taken into consideration. The physical features should provide space for a planning room, proper storage of tools and materials, and placing of bulky equipment. Attention should be given to use of floor space, ventilation, and fire and accident prevention. The lighting should be adequate on dull days. Artificial lighting should be provided to supplement natural light and to furnish illumination for night time activities.

The methods employed in teaching general shop are much the same as those used in other teaching fields. Individual and group instruction, demonstrations, projects, texts, reference materials, visits by professional people, tests, moving pictures and slides, charts, class excursions, individual instruction sheets, information sheets, assignment sheets and job sheets may all be used.

Almost any of the conventional type of tests may be used, but the objective type of test is recommended, either standardized or informal. Informal tests must strive for validity, reliability, objectivity, flexibility and ease of scoring.

The training of the general shop teacher should be broad. He should be prepared to conduct courses which embody rich opportunities for exploration and guidance. This demands that he must have a broad knowledge of various industries and the opportunities they offer. He must be skilled in his profession in order to be efficient. The teacher should be trained in psychology, principles of education, history and philosophy of education, and curriculum construction for both junior high and senior high school. Not only is it important that the teacher be well trained at the outset of his teaching career, but it is also important that he take advantage of every opportunity to keep abreast of his profession.

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APPENDICES

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APPENDIX A

NAMES REFERRING TO THE GENERAL SHOP

Arts and Crafts Shop	Laboratory of Arts and Industry
Arts and Industry Laboratory	Manual Activities
Community Repair Shop	Manual Arts
Composite shop	Manual Education
Comprehensive General Shop	Many Purpose Shop
Diversified Shop	Multiple Activities
Everyday Mechanics	Multiple Purpose
Farm Mechanics	Multiple Shop
Farm Shop	Practical Activities
General Industrial Arts	Several Purpose Shop
General Industrial Arts Laboratory	The Community Shop
General Mechanics	The Creative Shop
General Metal Shop	The Industrial Laboratory
Graphic Arts	Vocational Arts
General Industrial Shop	
Handicraft Shop	
Home Mechanics	
Household Arts	
Household Mechanics	
Industrial Activities	
Industrial Arts	
Industrial Arts Laboratory	
Industrial Mechanics	
Laboratory of Industry	

APPENDIX B

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