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BULLETIN OF THE UNIVERSITY OF WISCONSIN
No. 941; High School Series, No. 17

STANDARDS IN MANUAL ARTS, DRAWING AND DESIGN

F. D. CRAWSHAW
Professor of Manual Arts
The University of Wisconsin

and

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Associate Professor of Drawing and Design
The University of Wisconsin

The University of Wisconsin
MADISON
June, 1918

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PREFACE

The organization of industrial schools in communities in which manual training is established in the regular school system, the educational and industrial survey, and the general problem of the reorganization of public school work, have brought about a marked transformation in the teaching of manual arts. In this transformation the department of manual arts in the University of Wisconsin has attempted to view new demands in the light of present social, economic and educational conditions. It has been and is now, therefore, evaluating old methods and practices in the teaching of manual arts in terms of present-day developments in public school education.

This bulletin gives general suggestions in methods of teaching and in outlines of courses of study for the commonly accepted divisions of the public schools, including the industrial school. It does not prescribe just what shall be taught in a particular subject, school year or type of school, nor does it dictate a method of teaching, because the subject matter and the method of teaching will vary with local conditions. It does present, however, a definite educational program in the field of the manual arts and it expresses desiderata both in method and context for particular school conditions.

Supplementary and detailed material upon any particular subject or for any particular type of school will appear in forthcoming bulletins if the demand warrants their preparation and publication.

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STANDARDS IN MANUAL ARTS, DRAWING AND DESIGN

THE POINT OF VIEW

Pedagogical.

Manual training as the term is used in this bulletin refers to the *method* by which industrial work is developed under school control. It signifies a plan by which hand, tool and machine work is made educative through a series of progressively developmental problems.

Manual arts as herein used indicates the content of the several *subjects* which are included in a division of the school dealing with industrial work.

Industrial education as used herein refers to the study of all or a branch of *industry* (a manual art) by means of the most approved pedagogical and industrial methods. It includes both information about and practice in industry.

There has come into the shops and drawing rooms of our American schools a form of handwork which can be characterized perhaps by no better term than "busy work," in which there may be little or no educational value. Teachers in the field of manual arts, then, need to look to the motivation of its subject matter quite as much as do those who are teaching language, mathematics and other subjects of the academic type. When boys and girls are found in manual arts classes who fail to be interested in their work, it is an indication that the proper mental stimulus is lacking.

Theoretically, training in the manual arts is a valuable means to an educational end because it takes account of the child's natural demand for a physical activity to accompany mental development. Practically, it serves its purpose as a means to this end when by proper motivation it creates in the pupil an interest in his work

The motivation may be secured as a rule by one of three natural means, viz:

1. The desire to create because the creation satisfies a personal demand in the life of the creator, such as the making of something which the maker will use.

2. The desire to create because the creation satisfies a demand in the life of someone in whom the creator is interested, for example, the making of something which will be used as a gift.

3. The desire to create because in the process of creation the creator will achieve a new goal, that is, the making of something for the sake of accomplishment.

By any one or all of these means of motivation, the manual arts will secure interest on the part of the individual creator. With interest secured, the pupil will react in an individual way to what has become an individual problem. Therefore, to make this reaction a most valuable experience for the pupil there is needed only the helpful guidance of the instructor. This may be given to the best advantage only when the instructor has organized his teaching material to make the work of each and every pupil more and more independent and individual. He must therefore have a plan of developing his subject step by step, by groups, or units of instruction. Each group should represent essential fundamentals in individual performance and in elements of industry or of the trade of which the subject taught is a part.

Such a plan will insure the solution of definite groups of problems by all members of a class. The *particular* problem to be solved by any pupil, however, is represented by the project which he chooses to make. To be sure this project must be representative of the group of problems determined for all members of a class by the instructor's plan, and it therefore represents a class problem. It becomes an individual problem also because it is the choice of a particular pupil of all the possible problems within a group.

If this particular point of view regarding the division of subject matter and its use by pupils is understood, it is needless to say that there will be definite progress made by all members of a class, for each one will get something from every part of a course. Just how much and the particular kind of a problem each pupil will get will depend upon his choice of a project. This project may repre-

sent a social, industrial or agricultural interpretation of the general group problems. It may be made to meet both individual and community needs.

CLASSROOM CONDUCT

In terms of class instruction it must be apparent that the scheme of developing an industrial subject, as suggested above, means both class instruction upon the general problem or problems suggested by a group in the instructor's plan, and individual instruction upon each pupil's project.

CLASS INSTRUCTION

The class instruction should be in the nature of demonstrations upon a project similar to any individual project to be made by any member of a class and discussions upon the technical and industrial problems involved. This class instruction should take up comparatively little of the time of a class period, perhaps one-fifth, and not more than one-fourth. It should be direct and upon the common problems to be solved by *all members* of a class in the making of individual projects. It should be developmental, as far as possible, rather than dictatorial in character in order that it may develop actual participation by all members of a class. It should produce in each pupil a desire to read, observe and investigate between class periods and thus to secure for each one as large a fund of industrial information as possible.

INDIVIDUAL INSTRUCTION

The individual instruction should be systematic rather than disorganized. The instructor should interview all members of a class, secure from each a working plan of his next step in the making of his project, and finally approve this plan. He should always make his instruction constructive by means of encouragement and criticism which will establish ideals and give the pupil new ideas. Such instruction will result not in the doing for a pupil but rather in the suggesting of means by which the pupil *will do for himself*. Each pupil should produce, finally, a complete working drawing of his project.

No period of individual instruction should close without at least a mental summary by the instructor of the performances of the class in order that at the beginning of the succeeding class period he may bridge over the intervening gap, caused by the time which has elapsed between the meetings of the class, by recalling both good and bad points in the conduct of the last class period, thus orienting the class and shortening the time before they will again actually participate.

Industrial.

That one part of every individual's education should be vocational and at least semi-technical is self-evident when it is realized that the great majority of the American public is occupied in life's work in some form of manual labor. As the child reaches the age when the state relinquishes its hold upon him as a school subject, he realizes somewhat his possibilities as a wage earner. He sees everywhere about him men and women whose daily life is spent in an activity of which he knows little or nothing. He begins to feel that the information which he is getting from books has almost no relation to the work which he apprehends will be his when he leaves school. As a result, he longs to join the great army of his fellows who early leave school to accept wage-earning positions. It is at this point—in the grammar grades—that the teaching of manual arts should offer a real point of contact with the workaday world. It should begin to deal with materials of industrial significance, and in a way which will train the youth in processes which the industrial worker follows in his life in the factory or business house.

If the manual arts shop will provide a form of real industrial work which is based upon the principles of educational handwork, and if, in addition to this, the bookwork and laboratory work of the school will take a practical turn, there will be fewer boys who leave school in the sixth, seventh and eighth grades.

Industrial education, so called, and manual arts work must be essentially the same. Each must have for its purpose the acquisition of a fund of knowledge capable of making its possessor an efficient future worker in the industrial world. It must acquaint the individual with the tools and materials used in industrial processes. It must do more than this—it must give him a broad out-

look upon industrial conditions; it must help so to organize his individual forces that he may have as a result of his knowledge and skill, a mental, moral, and physical control of himself; it must do its part to make him, in a word, a useful, helpful citizen.

Beginning very early in the school process the course of study should include both vocational and non-vocational subjects. In doing this it is quite possible, without sacrificing anything of the broad, general foundations which it is the duty of our elementary school to lay, so to arrange the shop curriculum that as early as the sixth grade the motor element in the school work shall have a strong industrial significance. This may be done by organizing all industrial work on the unit industry basis. Each unit should be typically industrial both in practice and in the information given regarding the practice. By offering a program of this kind, every sixth, seventh and eighth grade child will secure a modicum of both practice and theory in a number of the more common industries. This will serve the end of a broadened education or of a future vocational selection.

The high school should continue this program of selected industrial experience and, besides, from the very first day of the first year throughout the entire four-year course, should offer opportunity for specialization for those who will not complete such a high school course but will enter industry at the end of any one of the high school years. The field of choice should be much broader than it is now. There is no reason why it should be confined to the rather narrow field of industrial life represented in the traditional manual training courses, nor to the particular sequence of subjects as they are ordinarily arranged. Some specific knowledge must be acquired and a definite power must be developed in the line of work in which the student will probably engage. In addition to this training for a specific occupation we must give as broad a knowledge as possible of our social and industrial problems. The useful citizen is not only a good producer but he is also a good consumer, and he should therefore understand the social and industrial significance of modern methods of production and distribution.

Aesthetic.

A review of the commercial development of a nation shows the arts of design and construction closely related to the development of the industry of the nation. With industrial expansion, however, the art of aesthetic design is in danger of elimination. To give design its true place in relation to construction this bulletin emphasizes the importance of this subject by giving suggestive problems in design simultaneously with those in construction for each of the divisions of the school.

Freehand drawing as well as mechanical drawing is a means of expressing design and construction. Both should be used as integral parts of all manual arts work as a means of conveying ideas. Freehand drawing is a valuable factor in vocational pursuits for interpreting aesthetic values in industrial products. This bulletin does not advocate freehand drawing as a separate subject for the first six grades. During this period the grade teacher should use drawing and design for instructional purposes. It is contributory to the successful presentation of subject matter.

Beginning with the sixth year and continuing thereafter, drawing and design are taught as distinct subjects but are closely correlated with other lines of school activity.

It should go without saying that one of the dominant elements in the manual arts is good construction; another is good design. In fact, if these are not considered fundamental the subject cannot have either the educational or industrial values which may otherwise be claimed for it. If it were not for the fact, however, that both of these essential elements are often sadly neglected, space would not be given here for emphasizing their importance.

Good construction has been more evident in the manual arts work of the past than has good design. In fact it has not infrequently been regarded as the all-important part of industrial practice. But good construction is only one important factor in the practice work of the manual arts; indeed it is one part of good design. The design of a project should both precede and be simultaneously developed with its construction. The initial or blocked-in design should be completed before construction begins but thereafter the design should develop as the construction progresses. Only as the work in drawing, both freehand and mechanical, is regarded as an integral part of construction work can the design element become real. A

"paper" design may be good, but one which is not carried out in constructive material certainly does not serve its greatest purpose—that of creating good taste in appropriately adapting material to its possible form and shape. Either to develop a high standard of appreciation or to cultivate creative ability in design, the plan for fashioning material and the work of cutting, fitting and forming it should go hand in hand. This means that those who design must understand the necessities of construction and that those who construct must know how to cooperate closely with the designers.

SUGGESTIONS FOR THE ELEMENTARY SCHOOL

The Primary Grades

A. *Primary Grades.* The primary grades must be regarded as those in which a foundation is laid for all future work. This point of view precludes the possibility of doing work in the first three or four grades of the public schools which may be regarded as vocational in character. The child comes to the school in the first grade with little information other than that which pertains to the activity of the home. In it he has had little conduct control of an intellectual type. For the most part he has been allowed to follow his own "bent" with little restriction except in the narrow sense of discipline. He is a romancer. He has played and imagined and dramatized in a world of his own with the natural home environment influencing him in his selection of symbols, which for the most part have been stones, blocks, pieces of paper—in fact anything which happened to be near by when he was in the mood to imitate his elders.

Close observation of the play of little children reveals the fact that their powers of appropriation are far more developed than are their powers of expression. Little children get "big" ideas and carry them out in their play without attention to detail. There are probably two reasons for this. In the first place they do not see details—they do not observe closely—and in the second place they do not have the motor control or mental organization to translate into common language—either verbal or graphic—what they wish to express.

These theories, though well founded, may be expressed in terms of standards for the guidance of those who organize subject matter and select materials for the early primary grades.

1. Little children have information about few things which do not center in the home or its immediate surroundings.

2. Little children do not observe closely but get ideas, sometimes very false, about the large or bulky circumstance or situation.

3. Little children express themselves for themselves (later for others) with symbols representing real things. In this play expression they use the large muscles and large nerve centers and consequently handle comfortably only such objects as they can grasp without difficulty.

With these standards it should not be difficult to arrange the environment and choose the setting for industrial arts work in the primary grades. First and foremost, one should remember that the primary school is a time and place for gaining much information and making many adjustments, both physical and mental. The starting points are the individual home activities and the ending point is the life of many and different homes—in fact, community life in general.

To cater to the play instinct and gradually to control or harness it and to develop in the child habits of clear thinking and accurate expression rather than the possession of examinable knowledge, the industrial arts of the primary grades are divided into two main classes termed "expressional" and "technical" work.

In the primary grades, the arts of drawing and design are to be used as an *expressional* means of interpretation and appreciation for other subjects in the child's program. The primary teacher should be able to use drawing as a part of the language with which ideas are expressed. The closest possible correlation should be made, especially with construction work.

Motives and Standards for the Primary Grades

First and Second Grades:

1. Means of suggesting ideas rather than delineating form.
2. Automatic repetition of decorative unit into borders and surface patterns.

Third and Fourth Grades:

1. Closer adherence to facts of form and color.
2. Representation towards specific ends.
3. Beginning of formulative judgment.

For Both Grades:

1. Drawing regarded as a form of narrative expression.
2. Consider the tendency of the child to draw from what he knows rather than from what he sees.
3. Emphasis upon large essentials.
4. Increase child's vocabulary of technical terms.
5. Increase child's ability to draw from memory.
6. Familiarize child with standard colors.

Expressional Handwork

Expressional handwork is an illustrative means of teaching. It is a method of developing concepts by means of illustration. It does not develop accurate hand manipulation but does expand ideas by the use of concrete and physical materials. The accompanying illustration (page 14) shows a concrete expression of the idea of a farm by a class or group of pupils after the reading or telling of a story about a visit to a farm.

Not all of the details of the scene are worked out by each member of a class but all plan it together as a result of the work in reading, language, geography or history which they are doing. On the other hand each pupil may be held responsible for the construction of some one detail, and no more, and then again a few members of a class may each make one object, when the most appropriate one for the occasion is then selected for the project.

By careful planning on the part of the teacher, the class projects can be arranged so that each will develop in a concrete way the lessons which are being taught in the regular subjects of the school, or the idea or some of the facts about a holiday, an industry or a seasonal event. At the same time some one object in each succeeding scene may be carefully constructed for purposes of motor control in handling industrial tools and materials. Thus from each expressional project developed by a class, there may develop one common technical project which all pupils will make and which will be carefully demonstrated by the instructor.

Group Expressional Work for the Primary Grades

SUGGESTIVE PROBLEMS FOR EXPRESSIONAL HANDWORK

In problems such as these, emphasis will be upon the directed initiative of the child in means of construction.

I. The Home and Community.
   1. Playhouse or room in same.
      (Cracker, soap or canned goods box or boxes).
   2. Neighborhood, city block, public park, schoolhouse and playground.
      (Sand-table or pulp map).

II. Community Occupations.
   1. Street scene, front of store or interior of store.
      (Sand-table or arrangement of pasteboard boxes).
   2. Spring cleaning, gardening.
      (Sand-table).

III. Agriculture.
   1. Layout for farm crops, arrangement of farm buildings; planting, harvesting, threshing; dairying, feeding and grazing cattle.
      (Sand-table with projects developed in paper, clay and wood).

IV. Industry, connected with farm life.
   1. Sandpit, stone crushing, mining, well digging, butchering, butter making.
      (Ingenious contrivances arranged by pupils after studying the industry).

V. Industry in general.
   1. Plastering, concrete mixing, building construction, milling, making paper, logging, the sawmill, etc., etc.
      (Same means as in IV).

IV. School Correlations.
   1. Language and Literature.
      a. Dramatization of stories told or read

2. Geography.
   a. Making maps with crayon or pulp.
   b. The railroad, the wharf, the canal.
   c. The river, mountain, cape, bay, peninsula, etc.
3. History.
   a. Indian, cliff dweller, puritan, colonial life, the frontiersman, etc.
4. Number Work.
   a. Distances, areas, volumes, and the comparison of same.

(Unlimited means of expression through dramatization).

The following projects are suggested to show how drawing and design may be used in connection with construction work as a means of teaching other subjects.

EXPRESSIONAL DRAWING AND DESIGN

Nature Study. Paper cutting or tearing of vegetables, fruits, trees, birds, flowers. Crayon study of one tree for mass and spirit of growth. Sketches of twigs and leaves; color of birds and study of their migrations.

History. Methods of travel: horse and wagon, stage coach, railroads; rivers, canals, oceans, harbors, types of boats. Develop by pencil drawing or by models in wood or paper. Illustrations of fairy stories and myths; hunting stage of development, tree dwellers, their food, clothing, houses or shelter, tools and weapons. American pioneers.

Language. Illustrate in crayon or pencil a subject with a single motive as sea, sky, smoke; qualify single subjects as gray sky, blue sky, black smoke; amplify this in various ways, always adhering to one motive as the predominating thought in the illustration. Booklets written and illustrated.

Writing and Spelling. Cutting of letters and assembling them into words. Letter booklets.

Dramatization. See incidents connected with history.

Music. Time element in music connected with automatic repetition of elements in a border leading to an appreciation of rhythm in both arts. Illustrations for children's songs.

Technical Handwork

The criticism which has sometimes been made against the technical form of handwork, namely, that it is uninteresting and that it emphasizes in a dissociated way a technical process, is hereby overcome. The technical problem becomes a part of the expressional problem and yet has merit in itself inasmuch as it gives practice in fundamental hand and tool manipulation of industrial materials. Information is desired about these materials and practice with them is needed to develop valuable motor control.

When the individual project is introduced, one is confronted at once with the question of drill, repetition, and accuracy. Regarding these we believe that too little consideration is often given them in the lower grades. We agree with the theory that they should be given far more as hints and suggestions and less as examinable knowledge in these grades; but at the same time the teacher should not lose sight of the fact that he is dealing with children who are in the age of habituation, and that their automatic powers are plastic and receptive. The following examples of classified problems for expressional and technical problems in the primary grades will furnish a wealth of suggestive material for the teacher. She should be able to organize it to carry out a plan of correlation with regular school subjects or to develop sequential industrial operations and tool manipulations, or both.

From the expressional problems there may be selected and developed projects to emphasize *accuracy* in drawing, design and construction.

SUGGESTIVE EXAMPLES

Materials

I. Clay. Fruit. Simple utensils as tile, shallow dish. Figures for sand-table projects.

II. Paper. Bookmarks, cards, envelopes, booklets, playhouse furniture, sand-table projects.

III. Textiles. Mats, holders, simple garments for doll and playhouse, rugs, etc.

IV. Wood. Garden markers, simple game board, miniature industrial and agricultural implements, playthings and toys.

Technical Work for the Primary Grades

Correlations

I. Language. Careful technique in illustration of stories, designs for booklet covers, paragraph headings and tail pieces, drawings which will tell stories.

II. Number work. Comparative dimensions as taller, shorter, etc. Visualize linear, surface and cubic measurements as such, square foot, quart, etc.

III. Geography. Outline maps of rivers, coast lines, territorial dividing lines, etc. Color maps of small section showing soil, foliage, water, etc. Relief maps showing topographical features.

IV. Science. Flowers, seeds, bulbs, twigs, etc., for growth. Section views for design elements.

V. Nature Study. Leaves, twigs showing development of buds and foliage, seeds during process of growth, animals, vegetables and fruit.

VI. Play. Position of players in games, physical poses of players. Physical apparatus, as swing, teeter, scoot, etc.

Suggestions for the Middle Grades

B. *The Intermediate or Middle Grades.* Just when the most rapid transition between childhood and youth takes place varies with the individual. In all probability with most children it is in the period of the middle grades, considered usually as the fifth and sixth, sometimes as the fourth, fifth and sixth. The age limits for this period are ten and fourteen years approximately.

The desire for social contact becomes strong during this period and the play instinct seems to demand group and mass action. Children are no longer quite satisfied to play alone. Besides, they are not content with make-believe things if this means using abstract symbols to represent real objects. Girls naturally play with dolls and enjoy doing many of the things which they see their elders do in the ordinary home occupations. Boys congregate in groups and manifest the "gang" spirit. They are eager to help in the oc-

cupations of the father and from their descriptions of what they see men of the community do they are evidently beginning to observe rather closely the ordinary activities of life. Both boys and girls of this period are beginning to be interested in adult affairs.

The instructor of industrial arts for this period has the following standards then to guide him in the organization of teaching material for this period:

1. Children of the intermediate grades begin to observe rather closely the activities of their elders and have a keen desire to do the things which adults do.

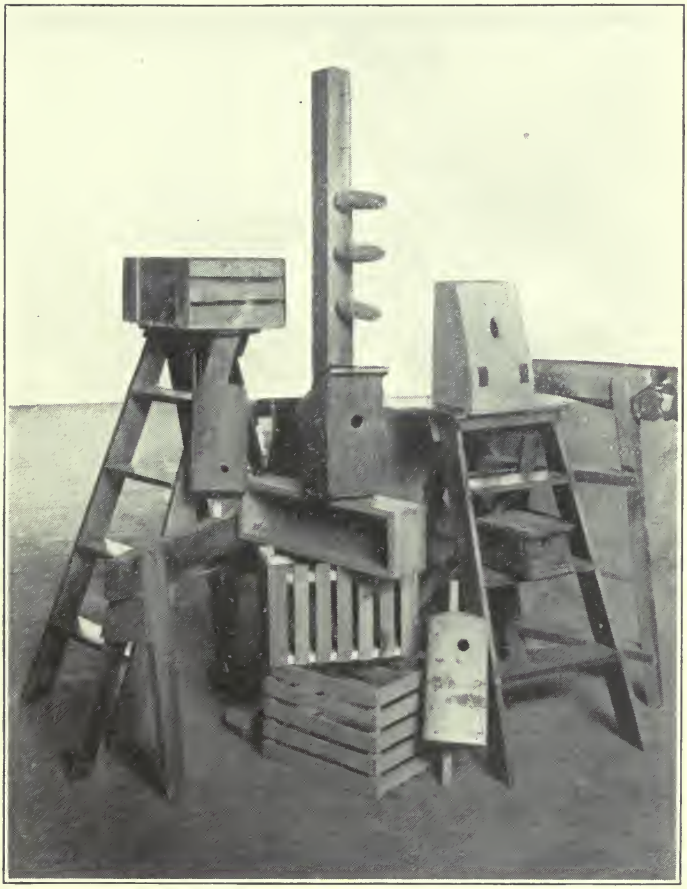
2. Children of the intermediate grades begin to play in groups and with objects similar to those used by adults in their work.

3. Children of the middle grades overreach their abilities in what they think they can do and in their play-work secure technical results which they realize are not of adult standard. They become easily discouraged if required to work too long for accuracy in detailed manipulations.

Such standards would seem to indicate that industrial arts subject matter should be selected from home and community adult occupations. These will not demand of the child extremely close application or too great attention to details. They will present real problems for solution which do not demand great skill in specialized occupations. They will be problems similar to those which confront fathers and mothers in the many improvements and repairs about the home and which men and women of a community combine to solve for the common good.

Perhaps no one type of community life typifies more completely the desirable problems for this period than does the small town or the farm. In neither of these is all of the specialized equipment for particular fields of labor found. Although the urban community and the well-regulated farm home have their many convenient tools to be used for all sorts of work, these tools do not compare either in quality or quantity with those possessed by the skilled mechanic or by the woman who is a specialist in one branch of woman's work.

Instead of providing for the middle grades, then, a well-equipped industrial center in the form of a special shop for boys or a kitchen or sewing room for girls, it would seem wiser to provide for children in these grades a *general utility room* in which they can "do



Farm Products for the Middle Grades Involving Training of the Large Motor Centres

things.'' For the boys this will mean a room in which are kept many of the more common tools for woodworking, hand metal working, including a little pipe fitting, sheet metal work and electric wiring; tools for simple concrete construction, gardening, and probably an equipment for simple printing. For the girls a room will be needed in which hand sewing and craft work in textiles and weaving materials can be carried on; facilities for developing some of the simpler home occupations, such as plain cooking (one stove only necessary), dusting and cleaning, the making of beds, etc. Many of these occupations may be practiced in ''playing house'' with dolls but in the latter part of the period the child should become familiar to some extent with the real work of the home.

The attempt is made in the following suggestions to indicate a wide variety of possible home and community problems in groups or classes.

SUGGESTED PROBLEMS DEMANDING THE CONSTRUCTION OF SHOP PROJECTS

I. The house.

Kitchen conveniences, as breadboard, scouring board, knife box, towel rack, broom holder, step ladder. Other house conveniences as simple stool or tabaret, shoe shine box, ironing board, wood box, wash bench.

II. The barn.

Bins and crates, harness rack, case for medicines, milk stool, floor scraper, bench, trough, nail box.

III. The yard.

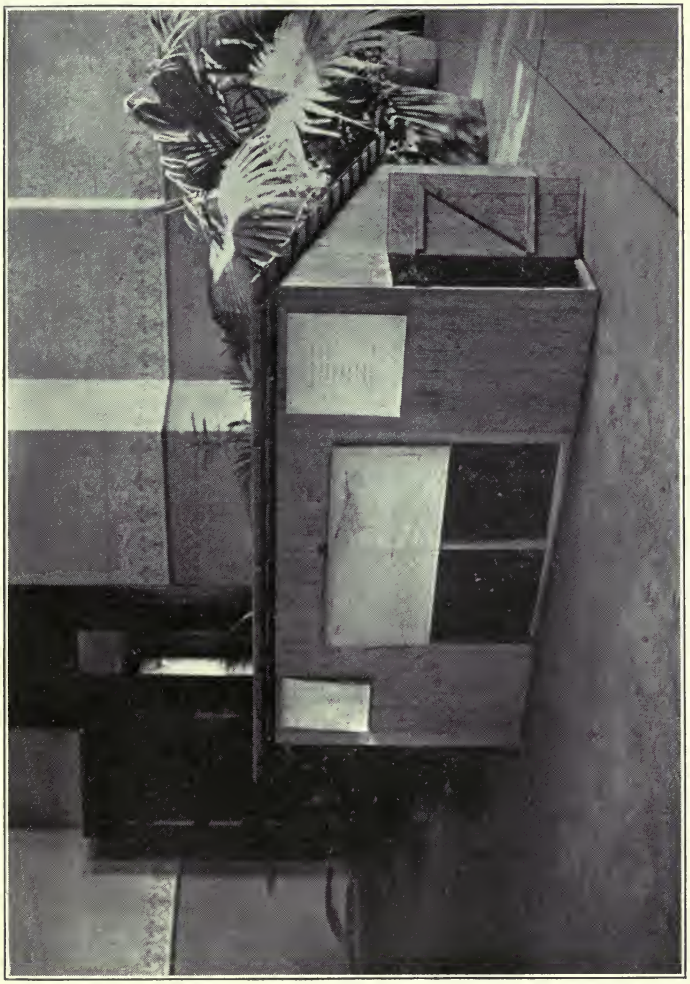
Garden and flower stakes, seats, urns, flower box, steps, swing, snow shovel, snow scraper.

IV. The garden.

Markers, measuring stick, boxes for seeds, wheelbarrow, trellis, propagating box, drying board.

V. Home occupations.

Chicken coop, dog house, feeding troughs, rabbit pen, birdhouses, traps, clothes stick, ash sifter.



Middle Grade Problem With Home Interests

VI. Games.

Teeter, sand box, croquet wickets, bean bag board, children's toys, playhouse, bow and arrow, gun, dagger and sword, scoot, wagon.

Drawing and design in the middle grades are to be taught by the grade teacher under the supervision of the art director. As in the primary grades, no set time is advocated for the drawing lesson but the work is developed in the process of teaching the usual subjects.

Motives and Standards for Drawing and Design in the Middle Grades

1. Note loss of spontaneity and confidence exhibited in the work of the elementary grades.
2. Note gain in the desire to improve the crude efforts of earlier grades.
3. Increased importance of drawing and design as a definite factor in classroom work and home and community activities. Industrial application as in buying.
4. More intense concentration upon details of form and structure.
5. Desire for more complete mastery of materials.
6. Design to be associated with some concrete problem, introducing as design elements, conventionalized units of natural forms.
7. Judicial criticism of articles for sale in stores, familiarity with mail order catalogs, testing articles by application of design rules involved in appropriateness, good proportion, character and fitness of enrichment.

REPRESENTATIVE DRAWING

Nature Study. Trees: intensive study of specific trees as ash or oak. Types of oak leaves, acorns, etc. Progressive sketches of the development of growing plants. Birds, their habits, colors, migratory flights (maps), birdhouses. Phases of the moon and its orbit. Location of prominent stars.

History. Draw Roman and Greek implements in connection with mythology or history. Dramatize explorers and discoverers of America. Draw or make models illustrating the evolution of the wagon, plow, harrow, grain cutter, thresher.

TECHNICAL EXPRESSION

Arithmetic. Drawing to scale; plan of a lot, measurement of fences, map of country road, map of a city block. Draw flower garden to scale. Find length, width, perimeter, number of square feet devoted to garden plats, paths, etc. Draw table for weather reports, score cards for various games. Make patterns for paper boxes for specific uses.

Physical Geography. Model relief maps of local community by means of sand or paper maché. Model water shed, etc. Draw maps for various purposes in regional geography.

DESIGN

Nature Study and Civics. Birdhouses for certain types of birds. Design motives from nature as enrichment for nature booklets. Posters for clean-up campaign. Model city parks. Design showing where and how trees and shrubs should be planted. Suggest means of correct yard decoration. Designs for gardens.

Domestic and Manual Arts. Study catalogs for good design. Design simple cross-stitch patterns, dolls' clothing. Matching of color, tints and shades, wood staining and painting. Design shop projects.

Suggestions for the Upper Grades

C. *The Grammar Grades.* Following a period of general occupational or industrial work in the middle or intermediate grades, it is perfectly logical that a more segregated and specialized type of work should be developed for the grammar grades. Children in the last two grades of the elementary school are entering the period of youth. They are forming permanent habits and consequently their adjustments, both mental and physical, are more minute than formerly. In fact we are now dealing with young *men* and young *women.* Our standards then should be very "near adult" as indicated below.

1. Children in the upper grammar grades are little men and little women. They can do quite accurately most of the things which adults do, excluding the most minute and difficult details.

2. Children in the upper grammar grades demand worth-while and real occupations, either as a means of interesting them in school or to give them guidance for near future wage-earning occupations.

3. Children of the upper grammar grades are interested or may easily be interested in special lines of work typical of those in which men and women earn a living.

Differentiated courses of study for boys and girls in the upper two or three grammar grades will do much to hold them in school. If they are so held they will get the benefit of a full day in school, one-fourth or one-half of which may be spent in construction work, (all not necessarily from the industries) taught in accordance with good commercial standards. The remaining part of the day will be used in the academic work of the school which should be closely related to the construction work. Pupils who will thus be segregated in differentiated courses will be saved from early entrance into wage-earning positions where they would receive the benefit of a vocational continuation school for only a few hours each week. In the average community or school it may be impossible to provide for many special occupations. The teaching force and the equipment demanded for such a differentiated scheme as is described later under the heading, "The Junior High School," may be impossible. Nevertheless, in any community or school where it is possible to provide for one line of work it is equally possible to provide for two or three as suggested by the two plans described below.

PLAN A

As the customary upper grammar grade industrial arts work for boys is woodwork and as this work for many years past has been regarded as the most profitable one for manual training, the benches and tools may continue to be used both for elementary bench woodwork and for a large portion of the work done in furniture and cabinet making and also in carpentry. These last named branches of woodworking are possible for seventh and eighth grade boys if too difficult tasks in them are not undertaken.

The woodworking benches can easily be covered with a false wooden top and used for metal working of the thin sheet, strap and rod type or for tin smithing. No one of these branches of metal working requires elaborate equipment and none is desirable

for these grades. A metal working vise can easily be attached to the end of the woodworking bench or, if there is space about the room, rough running benches may be installed. (They may be constructed by the seventh and eighth grade or high school classes.) Upon these the metal working vises may be placed and the woodworking benches preserved for woodworking. Either upon the woodworking benches, the running benches about the room, or in the basement corridor, frames may be raised upon which electrical wiring can be done; while in the basement there can usually be found some space for elementary cement and concrete work.

It is apparent that, with a little ingenuity and a will on the part of the instructor to do, and with comparatively little additional space, equipment or teaching force, the ordinary two years of woodworking in these grades may be supplemented by other lines of industrial work to make a rather formidable list. None of this work should be regarded as vocational but rather as *general* or *prevocational* in character. The plan previously suggested for the middle grades is not here changed except that the general occupational work of the middle grades is subdivided into *industrial components* and each is given special attention for a term, or for a shorter or longer period as desired.

The work for girls in these grades has been somewhat more differentiated in the past than has the work for boys. They have ordinarily been given sewing and cooking. With the same equipment as is now provided for girls for upper grammar grades simple millinery and dressmaking may be added and cooking may, if desirable, be subdivided into plain cooking, canning and preserving, cooking for invalids and infants, etc.

UNITS OF WORK

Boys' Work	*Girls' Work*
Bench work in wood	Plain sewing
Furniture and cabinet making	Simple dressmaking
Decorative metal work	Millinery
Sheet metal work	Plain cooking
Cold wrought iron work	Canning and preserving
Electric wiring	Cooking for invalids and infants
Printing	Home sanitation

PLAN B

In schools in which manual training and some form of home economics have not been practiced in the seventh and eighth grades, or in new schools not of the junior high school type, rooms for girls and for boys may be arranged to accommodate the several lines of work suggested in Plan A but with greater convenience than this plan suggests. The room for each sex should be rather larger than the one heretofore provided for either boys' or girls' work. In the center of the room will be placed tables or benches for work requiring the most extensive equipment. For boys the bench can be designed for both wood and metal work and possibly, also, for both freehand and mechanical drawing. About the room booths can be constructed in each of which will be placed a very limited special equipment for each of the several lines of work suggested in Plan A. This arrangement would mean a *general shop* rather than several special shops and yet with the booths it would furnish the means for special work. With not too large a class and an efficient instructor, at least three or four special lines of work can be conducted at the same time.

The room for the girls would not differ greatly in arrangement from that for the boys, but would in equipment. In the center of the room would be tables or desks upon which cooking and sewing (if necessary) and drawing could be done. In the booths about the room the more special lines of work could be carried on, such as serving, caring for bedrooms, laundry work, etc. Any special home-making or home-keeping requirements might be provided for in one of the booths; for instance, cooking on a wood or coal range, as under farm home conditions.

The particular arrangement of the room would depend upon the demands of the community. The suggestions in both Plans A and B are for the purpose of developing the idea that *without carrying out the rather elaborate plan of a junior high school* as considered in the next section, its *essential benefits may accrue* in a one-room industrial department with *one teacher in charge* and with an *equipment not necessarily much more extensive or expensive* than those which have been provided in the past for only one or two lines of industrial work in these grades.

This description suggests the arrangement for an industrial room for grammar grade pupils. There should be one for girls and one for boys.

Below is a list of the possible occupations which may be cared for in such a room.

CENTER OF ROOM

General table or group of tables or benches.

Booths. Boys.	*Booths. Girls.*
Printing	Cooking
Cobbling	Nursing
Sign painting	Sewing
Cement and concrete	Ironing
Clay work	Laundry work
Design and crafts	Millinery
Tin work	Dressmaking
Sheet metal work	Serving

Drawing and design for the grammar grades should be industrial and pre-vocational in character, descriptive and explanatory of the projects and processes in the industrial work. The work should be conducted under the immediate supervision of the art or manual arts supervisor.

Motives and Standards of Drawing and Design in the Upper Grades

1. Specialized and pre-vocational in character.

2. Importance of beauty of proportion and structure in manufactured materials emphasized as a valuable cultural and commercial asset.

3. Constant drawing of objects whose lines represent beauty of structural form and spacing; good surface enrichment.

4. Three types of sketching should be employed: a, quick sketching to develop the pupil's power of rapid delineation; b, the carefully drawn freehand sketch or drawing showing fully all details of construction, form and color; c, the working design-drawing fully enough developed to include all data necessary to the craftsman.

5. Essentials of civic beauty in the home, community and city. Essentials of beauty as illustrated by world and local monuments in painting, sculpture and architecture.

6. School museums of fine and industrial arts.

SUGGESTIVE CORRELATED PROBLEMS IN VARIOUS ACTIVITIES

Agriculture. Sketch of desirable points in good seed corn, grain, etc. Sketches and booklet of bird families, as fly-catcher; their color, habits and value to man. Draw common fungi, as mushrooms, and bracket fungi; dicots and monocots. Detailed growth of flowers, as dandelion; its spirit of growth, distribution of seeds, etc. Plotting curve of temperature and barometric pressure.

Arithmetic. Plan a room, determine area of walls, cost of papering, painting. Compute areas of actual tracts of land from scale drawings. Lay out baseball diamond.

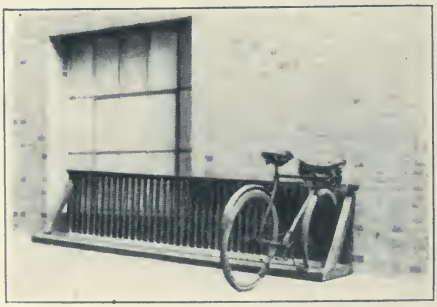
Geography. Model reliefs of surfaces, using sand and paper. Draw maps of various types, stressing forestry, agriculture and metallurgy. Highways of trade.

History. Illustrate booklets of industrial facts as products of soil in the state, occupational pursuits of inhabitants.

English. Write and illustrate booklets upon special subjects, as birds; their appearance, form, color, name, food, nests, eggs, young, enemies, song, migrations, value to man, personal observations. Plants; use, value, where found, general appearance, detailed appearance, parts used for food.

Industry. Designs for manual arts and domestic projects. Principles of design. Color harmonies. Practice in color matching. Home and school decoration. Good taste in dress. Collected designs for home furnishings, clothing and household utensils.

Civic Design. How can a city be made more convenient for work, economical for business, healthful for home life, pleasant for social life? What may be done to improve the city's or town's site, its communication with the outside world, public conveniences? Simple landscape architecture for the home, city and community.



THE JUNIOR HIGH SCHOOL

The difference between the organization of industrial arts in a junior high school and that suggested in the preceding section for the seventh and eighth grades depends largely upon the physical possibilities of the particular junior high school under consideration. It has been said that some junior high schools differ from the seventh and eighth grades and the freshman high school years in an eight grade elementary and a four-year high school scheme of organization *in name only.* This suggests that merely segregating three grades without changing the form and spirit of the work done in them does not make them different in their aim and purpose even though there may develop some material advantage in having them separated.

The aim and purpose of the junior high school must be different than that of similar grades under the eight grade elementary school and four-year high school organization. Of all the advantages which have been claimed for the junior high school organization some of the most important are the following:

1. It offers a wide range of opportunities through differentiated courses to deal with individuals and small groups.

2. It serves to hold children in school and bridge the gap between the grades and the high school in which so many are lost to future school life. This comes at the beginning of the adolescent period of growth.

3. It furnishes an opportunity of discovering individual aptitudes and determining vocational choice.

It is obvious that to aid materially in accomplishing these desirable ends the industrial arts must be organized with the following standards in mind:

1. Junior high school industrial arts must be organized on the basis of a series of unit courses.

2. There must be in a typical junior high school organization, a considerable number of courses representative of common industrial and other occupations. From these presumably all children will elect for the value resulting from the securing of much information about these occupations and the practice gained in them.

3. The industrial arts courses arranged to be taken by all children should offer opportunities for individual election in cases where vocational choice or individual aptitude seems to demand a degree of specialization.

These standards in industrial arts can best be attained by organizing teaching material into separate industrial occupation units and providing a separate room and equipment for each one. Further, the time devoted to each course must be sufficient to acquaint individuals with essential information and give them practice and opportunities in the work. The instruction given in each course must be substantial in the fundamentals of each occupation chosen but it need not be complete in the sense that it develops skilled workers. It should be prevocational rather than vocational in its aims and yet it should lead to vocational results if continued and accompanied by adequate practice for a long enough period of time.

It is manifestly true that in a large school system a junior high school may provide a number of separate shops or laboratories and thus carry out, as far as physical conditions are concerned, the full intent of the standards as stated. The three following plans are suggested as examples of possible organizations of courses.

PLAN A

(The large junior high school with maximum number of individual equipments.)

Each unit course is to be given for a period of nine weeks Number of periods per week, five; length of period, ninety minutes.

First Year (Seventh Grade)

First Period. Bench woodwork covering the use of the principal woodworking hand tools common to all woodworking trades. Individual and community projects of vocational value.

Second Period. Elementary handtool metal work. Chipping, filing and fitting, involving hand and power drilling. Fastening with rivets, screws and bolts. Simple constructions with cold strap iron. Thread cutting and simple pipe fitting.

Sheet Metal Work of Industrial Character for the Junior High School

Third Period. Sheet metal work. Tinsmithing. Constructions in tin, principally covering type forms of cylinder, cone, pyramid, etc., and such intersections as are involved in ordinary tinware.

Fourth Period. Elementary furniture and cabinet making involving advanced construction in bench work and the use of woodworking machines in the commercial methods of getting out stock; decoration with metal pulls, escutcheons, etc.

Second Year (Eighth Grade)

First Period. Electric wiring. Running lines and making connections for bell, light and telephone circuits. Simple constructions and general information for motor and dynamo work.

Second Period. Mill work. The cutting and fitting of stock for furniture and cabinet construction.

Third Period. Elementary carpentry. The practical use of the steel square and its simplest mathematics. Rough framing of dwelling or the construction of garage or shed.

Fourth Period. Cement and concrete work. Mixing and pouring concrete for piers, foundation walls and sidewalks. The construction of forms for rectangular objects such as a trough, and simple cylindrical mould and sweep work.

Third Year (Ninth Grade)*

First Period. Printing. The elements of the printer's trade in design, composition and the manipulation of a hand press; setting up and knocking down forms, distributing type and all necessary work pertaining to ordinary small job work.

Second Period. Pattern making. The elements of the trade in drafting, laying out and constructing patterns for small machine parts involving draft, shrinkage, coring and parting.

Third Period. Elementary machine shop. Practice leading to the work of a machinist which involves the more fundamental operations on such machines as the drill press, lathe, shaper and planer, and possibly some work on the milling machine.

Fourth Period. Elective. An opportunity to take a second unit in one of the branches already enumerated. For some whose residence in school is limited to less or no more than the junior high school period this election may come earlier.

PLAN B

(The small junior high school with a limited number of individual equipments.)

In the smaller communities where expense of equipment and instruction prohibit an organization similar to that made in Plan A the length of time devoted to a unit course may be extended to one semester and the length of periods or the number of periods per week may be reduced. Six units may be provided, one for each semester, covering the three-year junior high school period. The selection of units will depend upon the partial use of one equipment for different courses, the vocational opportunities of the community and the units of work for which instruction can be provided. For example, if the least possible expense for equipment is the controlling factor, then a general equipment for woodworking will provide for courses in bench woodwork, furniture and cabinet making, and pattern making; and a general equipment for metal work will provide for courses in elementary handtool metal work, sheet metal work and electrical construction.

*NOTE: The sequence of units in this organization is suggestive only.

Again, if the units were selected upon the basis of expense, such courses as electric wiring, cement and concrete construction, painting and carpentry might be chosen, as none of these requires expensive or extensive equipments.

PLAN C

(The school system which has a woodworking equipment suitable for grammar grade and high school work and which is to develop to a junior high school basis.)

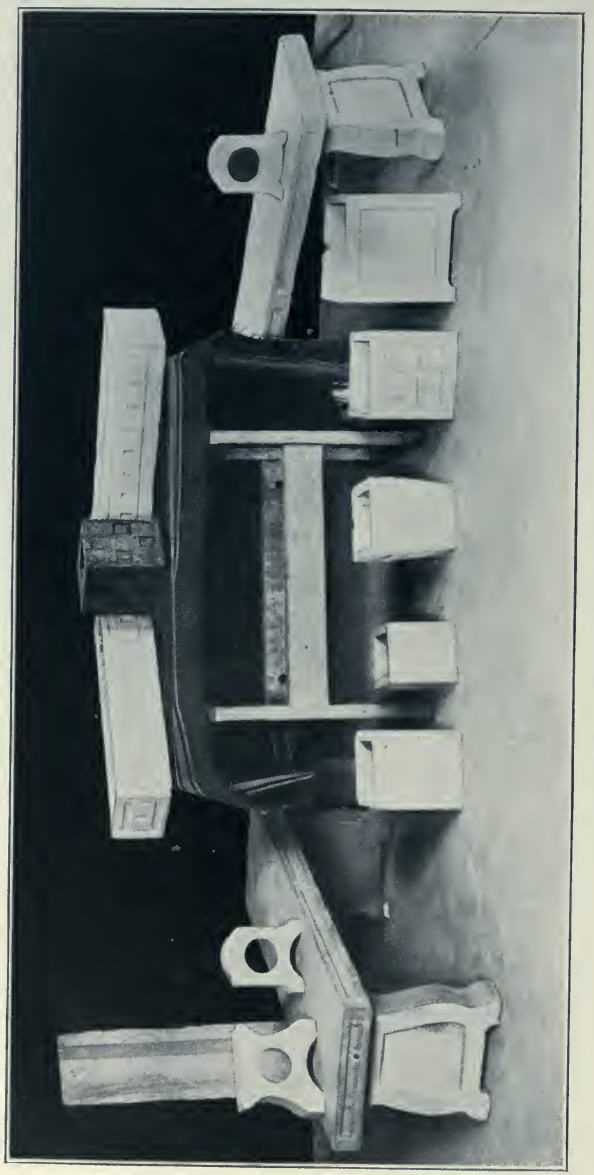
With an equipment limited to woodworking and with no possibility of securing additional equipment, except perhaps a few general tools, the school wishing to advance toward a program of differentiated courses has but one course to follow; namely, to secure a sufficient number of tools for industrial work, such as cement and concrete work, upholstering, electric wiring, etc., and to carry each of these on in the woodworking shop for a stated period of time. Such an arrangement will mean more or less confusion if one room must be used during a particular period of time for more than one line of work. It is usually possible, however, to find some other place in which the new courses not needing much special equipment may be started.

The examples given for industrial arts organization in a junior high school all refer to boys' work. The work of girls can be equally well organized and upon the same basis as given in Plans A, B, and C.

It must be understood that paralleling the industrial work suggested in each plan, work in freehand and mechanical drawing will be carried on either in the form of unit courses correlated with the industrial work for the same period or as an integral part of the industrial work.

DRAWING AND DESIGN

The work in drawing and design in the Junior High School should be pre-vocational, yet specific enough to emphasize particular home and community problems. Whenever possible, the pupil is to be brought into actual contact with vocations or at least with live vocational aspects of industry. One large studio-laboratory,



Industrial Type of Cement Work for the Junior High School

equipped with tools and materials of the industrial arts, drawing and design, will be sufficient for the industrial arts units herein suggested. These units or blocks of problems are sufficiently broad in content to react favorably, either towards home, community or industry. While separated lines of problems are suggested for boys and girls, it will be noted that there are many points common to both sexes, as for example, the presentation of the *principles* of design.

First Year. Unit, Costume Design. (Girls.)

1. History and sources of material.
2. Laws of color applied to materials and types of complexion.
3. Relation of design to lines of figure.
4. Pattern drafting.
5. Designing of borders, etc., for surface enrichment of doilies, mats, handkerchiefs and problems of similar type.

Second Year. Unit, Household Art. (Girls.)

1. Preparation of textiles, etc.
2. Sketching of costumed human form.
3. Analysis of color from nature and ornament.
4. Designing of costumes, hats, etc.
5. Dyeing.
6. Technical processes of pattern drafting.
7. Harmonious lines and color for the home.
8. Collected materials and costs for home decoration.

Third Year. Unit, Salesmanship. (Girls.)

1. Standards of good design, gauged by utility or fitness, proportions, contours, surface enrichment, color.
2. Matching of colors, color harmonies.
3. Money value of good design.
4. Catalog samples and other sources of materials collected and placed in a notebook to be labeled as to design merits and prices.
5. Quick freehand sketching from oral description of common objects as hats, ribbons, costumes.

First Year. Unit, Industrial Design in Wood. (Boys.)

1. Standards of good design, gauged by utility or fitness, proportions, contours, surface enrichment. Collected illustrations.
2. Mixing of stains and paints.

Design and Construction in the Plastic Arts for the Junior High School

3. Harmony of wood stains or paints with relation to floor covering, hangings, sidewalls, ceiling.

4. Designing bench wood-work problems shown in fully developed shop drawing.

5. Perspective drawing applied to shop projects.

6. Wood staining and painting; use of harmonious color with relation to environment.

7. Metal design for furniture fittings.

Second Year. Unit, Industrial Arts Design in the Plastic Arts. (Boys.)

1. Standards and principles of good design in cement, terra cotta, clay and plaster.

2. Working designs and drawing for materials in 1.

3. Freehand sketches of historic ornament.

4. Working drawings for mould and form making from given designs.

5. Modeling in clay.

6. Casting in various media. Plaster patterns in industry.

Third Year. Unit, Industrial Arts Design for Printing. (Boys.)

1. Standards and principles of good design in the printer's art.

2. Lettering and spacing. Show card work.

3. Color arrangement, ink color mixing.

4. Lay outs.

5. Designing for borders, cuts, etc.

6. Simple principles of drawing and design as applied to advertising.

7. Processes; line cuts, half tones, etc.

Senior High School Work in a Junior-Senior High School Organization

For the year succeeding the last junior high school year an extension of the plan of unit courses may be developed, in reality making thereby four years of junior high school, or for the three years following the last junior high school year, special work may be done in one industrial unit to develop sufficient skill to enable the pupil to enter the industry upon a wage-earning basis. It is

imperative under such conditions to have provided an equipment comparable with that of industry and instruction by a skilled industrial worker.

ONE YEAR HIGH SCHOOL COURSE

Since manual arts in the public high school has developed both so extensively and intensively, it may be assumed that it will continue in favor as a part of public education not specifically vocational in character. It is very common to find in our typical high school courses either manual arts offered as an elective or as the core for a course of study covering one or two years. When this is done it cannot be the thought of administrative officers to make the work vocational in character as the time allowed for it is not more than ninety minutes per day. One-third to one-half of this is devoted to drawing (usually mechanical with an element of freehand in it) leaving, usually, not more than three ninety-minute periods, or four and one-half hours per week for shop work. For one school year of thirty-six weeks this amounts to one hundred and sixty-two hours, no allowance being made for vacations and other occasions for lost time.

It would be preposterous for one to assume that in this time, work could be made sufficiently vocational in character to prepare one for more than mere entrance to a wage-earning occupation. There seems, therefore, but one sensible conclusion to make regarding the character of manual arts in a one-year high school course, that is, to make it serve the purpose of giving general information about at least a selected portion of industry and a practice in one or two important and allied branches of industry. Thus each pupil will become familiar with the chief technical features of the work and will secure the largest return in a broad cultural way.

Woodwork and mechanical drawing with a reasonable amount of freehand drawing have been subjects commonly chosen for the first year of high school, regardless of the kind or amount of industrial work done prior to this time. There are some very good arguments in favor of this program of studies. They represent lines of industrial work which carry with them large educational values. They also represent important occupational lines of work.

For pupils who have had little or no industrial arts in the grades

this program for a one-year high school course seems very reasonable. Likewise for first year high school classes made up largely of those who have had woodworking and drawing in the upper grammar grades, these same subjects may be profitably pursued if they are more intensively and more extensively treated. The vocational aspects of the courses may be made prominent and the individual pupil's desires may be met in the selection of projects to help solve some larger problem of social, civic, or economical significance.

Again, it must be remembered that woodwork includes more than one subject. If members of a class have had a strong bench woodworking course in the grades they might well take up in a one-year high school course work in furniture and cabinet making, carpentry or pattern making.

From the foregoing discussion it will be inferred that the particular subject or subjects in industrial arts to be included in a one-year high school course depend largely upon:

1. The kind and amount of industrial work which pupils have had.
2. The vocational as well as the cultural significance of the subject selected.
3. The educational and vocational demands of the community in which the course is given.

Particular community conditions will in part determine the subject to be given and the method of handling it. For example, in a strictly rural community, work of the nature of carpentry and cement would be given rather than that of furniture, cabinet making or pattern making. The subject would be taught to meet the needs of the farmer.

Again in a strictly industrial community, printing or some line of metal working might seem very much more desirable than woodworking. From the standpoint of pedagogical significance it is not so much a question of what is taught as *how* it is taught. In any case it should be the purpose of a one-year high school course in industrial arts to make the work of strong educational value but of vocational significance in regard to the type of project undertaken and the closeness to commercial or industrial methods with which the work is done. Work of the job type can have educational value quite as much as that of the dilletante, individual project type. It is the problem of large *significance* rather than the one of mean proportions which should confront the pupil. In any case

the work should be well organized in terms of tool manipulations, trade elements, social significance or some important guiding principle which will control progress and sequence. This is the teacher's duty. The pupil, on the other hand, selects the particular project of his liking to suit his conditions or technical ability, capacity and environment.

While the examples given are those which refer to the work of boys, it should be understood that the same principles apply to girls' work as to that of boys. The organization of subject matter and the method of developing it by instruction would be controlled by the ideals as set forth in the foregoing discussion. For suggestions in drawing and design see Two-Year High School Course.

TWO YEAR HIGH SCHOOL COURSE

What has been said of a one-year course in high school can equally well be said of a two-year course, except that in the second year a different group of subject matter should be handled. The division might well be made on the basis of industry. For example, if the woodworking industry constituted the basis of selection for the first year, the metal working industry might do so for the second year.

In the case of girls' work the first year might be devoted to home making problems of the textile industry type chiefly, while the second year courses might center about the culinary arts and the more scientific phases of home making, such as sanitation and food study.

It will be seen from what has been said about the one and two year courses that the type is different from that suggested for the junior high school. The courses may be no longer and again they may be much longer than those organized for a junior high school. Since the range of courses will be less, the breadth of subject matter will not be so great. On the other hand, the depth to which a class will go in the scientific and research direction will be considerably greater.

It is not so much a breadth of information about many typical industries or occupations that is the goal of the one and two year high school courses as a *breadth and depth of information about a few.* The one and two year high school courses will offer a con-

siderable amount of practice in fundamental tool manipulations but they will give also a substantial amount of information about the manipulations and the industry of which the practice is a part. This will be treated from the standpoint of scientific and technical study as far as possible. One and two year high school courses in industrial arts are essentially of general educational or cultural, rather than vocational, value.

DRAWING AND DESIGN

There is a growing belief of supervisors of art and manual arts that much of the teaching of drawing and design in the past has been abstract. It is accepted as true that a course in drawing and design should be substantially related to the industrial arts course. It is also true that design will supply a certain stimulus towards invention and an appreciation of true standards of beauty in articles of commercial significance. It should be taught, therefore, as far as possible as a vocational preparation for industry.

In addition to these points, it is recognized that community and civic problems must be introduced into the average art course. Therefore, the primary aim of the first two years of the following suggested high school course is to supply the pupil with a broad, useful and cultured knowledge applied to large life problems. The course, as suggested, should be successfully administered by the special drawing teacher, working in cooperation with vocational directors.

First Year. Home Drawing and Design, Industrial Design for Boys and Girls.

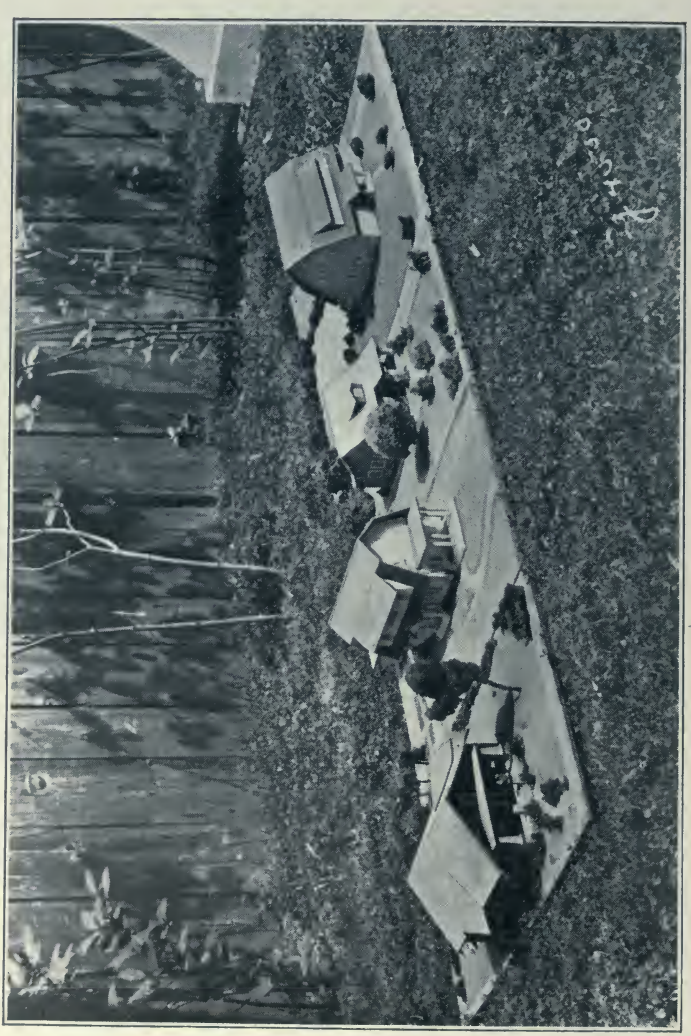
1. Division of home into units devoted to service; house, garage or barn, clothes yard, kitchen or flower garden, service ways, fences or hedges. Make scale drawing of same.

2. Discussion of size of house for proportions of lot and in relation to sun and prevailing winds. Economic use of ground.

3. Location of rooms in plan of house in (1).

4. Location and design of service buildings and structures; i. e., garbage and ash containers, etc.

5. Design of walks, paths and entrance ways and their relation to the design of the house.



Home Design for the Two Year High School Course

6. Uses, varieties, location and selection of trees for the lot. Conifers, deciduous and fruit trees and their economic, serviceable, and decorative value. "Spotty" planting and its correction.

7. Use of shrubs as surface enrichment for lots. Method of planting. Use of shrubs as boundaries or screens for undesirable structures.

8. Color balance, rhythm, contrast and proportion in flower planting.

9. Design for a vegetable garden.

10. Accessories for the garden; bird baths, trellises, sun dials, cement benches, flower boxes and urns.

11. Color harmony applied to painting the house exterior to harmonize with its setting and environment.

*12. General principles of design developed with the foregoing problem. Industrial applications.

13. Specific application to manual or domestic arts problems.

Second Year. Community Drawing and Design. Industrial Arts Design Laboratory Problems. Boys and Girls.

1. Discuss the design of your city; is it convenient for work, economical for business, healthful for home life, pleasant for social life?

2. Has the city been planned to meet the needs of today only or the needs of the future?

3. The city site. What has been done to improve rivers, water fronts, lakes, marshes, ravines, hills? What may be done to make them more attractive and useful? Suggest by sketches, desirable improvements.

4. Draw maps to show how the city communicates with the outside world. By railroads, by water, by roads.

5. How is the sanitation and the health of the city guarded? Draw maps and illustrate by sketches undesirable dumping grounds and other menaces to the health of the city.

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*NOTE: The preceding problems should be added to the plan suggested in (1) and the results visualized and developed in a small scale model of the house and grounds. Thin wood may be used for the house, with colored sponges and twigs for the trees and colored fine sawdust for the grass. Scale of ¼ inch or ⅛ inch to the foot may be used. By assembling these models, a community or block may be formed and results in design deduced of the utmost practical value. See page 44.

6. Make a one-point perspective sketch of a street with poles and overhead wires and signs overhanging the sidewalk. Repeat sketch with these elements removed. Criticise the effect and deduce results.

7. Is the city arranged with the thought of public convenience with relation to the following points: system of streets, lighting and shading of streets, regulation of poles and wires, regulation of billboards, transit lines, drinking fountains, public buildings? Design an attractive billboard and suggest a correct location for it. Make a ground plan of a civic center and locate it in relation to the street system and to its usefulness.

8. Make a plan of the playgrounds, small parks, school gardens and athletic fields in your school district. Are they convenient? Suggest improvement in their design.

9. Make quick pencil and color notes of homes in your community. Could they be improved by painting some of them a different color, by changing their form, by planting with trees, shrubs and flowers?

10. General principles of design developed from the foregoing problems.

11. Specific design principles applied to domestic or manual arts problems.

THREE OR FOUR YEAR HIGH SCHOOL COURSE

It must be assumed that at least the great majority of those who enter the high school do so with the intention of remaining through a four-year course. It is with this thought in mind that the suggestions for the one and two year courses have been made.

If now an administrative officer might be reasonably sure that a student would remain in high school but one, two or three years he could plan the course of such an individual with reference to his particular purpose in entering the school. Hence for any particular length of time in the school such a student should have his manual arts work arranged to prepare him definitely and as completely as possible for his future vocation, if it is to be industrial. Such work should be given the major portion of the student's time while the remainder should be devoted to allied and pertinent academic subjects. In short, the schedule of studies for such a student should be specific with reference to his known needs.

Having completed two years of industrial arts, the student who is planning to complete his high school course and continue into college will discontinue industrial arts work unless his schedule may be so arranged that he may elect an industrial subject without interfering with a program which is designed to prepare him for college. This suggestion is entirely in accord with those made heretofore, namely, that industrial arts for the first year or first two years of a high school course should be regarded as a part of a liberal education.

If a student, upon the completion of two years of industrial arts, decides to spend one or two years more in high school for the purpose of preparing as specifically as possible for some particular industrial occupation, he should elect his subjects in the industrial arts department with a view to his needed industrial training and his academic work to give as much definite information about and as broad an understanding as possible of the field of work. The work of his third year, or third and fourth years, should be largely elective and vocational in intent and character. It goes without saying therefore that instruction should be given by those who are in sympathy with the vocational plan and who are expert in the work taught. This may mean that in the case of industrial work a tradesman should be employed, and it may mean also that in some cases the cooperative plan should be operative whereby a student will spend a portion of his time in school and the rest in commercial employment in the community.

It certainly should be true that the school can make some contribution toward industrial wage earning, probably on the side of technical information about industry and particularly about the special occupation which one is planning to enter. It may also be true, even in regular high school industrial departments, that some special practice work will be possible which under ordinary industrial conditions would be impossible. It is entirely probable, in fact, that the average high school equipped for machine shop work or cooking, for example, can give practice which would not be procurable in any other way.

It is with the thought that the high school by means of a flexible program in industrial arts and substantial but selected academic work can prepare pupils for the better type of positions in occupations—those of the directive or business type—that the three and four year course suggestions are given.

DRAWING AND DESIGN

The third and fourth years of drawing and design in the high school may have a double motive: first, to prepare pupils to meet the college entrance requirements; and second, for professional, vocational or clerical activities. As the first motive usually requires a secure knowledge of outline drawing, perspective and light and shade, with a working knowledge of applied design its teaching may be left to the administration of the art and manual arts supervisor. The second motive is technical and while frequently developed alone by the art supervisor it should be in the hands of a specialist in the design of a particular vocation.

Third and Fourth Years. College Entrance. Boys and Girls.

1. Outline freehand drawing in pencil.
2. Mechanical and freehand perspective.
3. Light and shade in pencil, charcoal, or other fitting medium.
4. Color rendering in monotone.
5. Industrial arts design in theory and practice.
6. Color theory and practice.
7. History of art, including the minor arts and handicrafts. Accent to be placed upon the interpretation and appreciation of art.
8. Original observations and analysis from nature, art and industry, based upon the rules deduced from (7).

Third and Fourth Years. Industrial Arts Drawing and Design. Boys.

1. History and development of handicraft.
2. Principles of design: summary of the principles of the first two years, with notebooks of good design for different industrial arts products, such as automobiles, machine frames, wrought iron implements, furniture by periods, buildings; landscape design (simple rendering) applied to home, school or farm.
3. Relation of tools, processes and material to design of product.
4. Shop freehand sketches. Perspective, cabinet projection.
5. Shop design sketches.
6. Design and construction of simple buildings.
7. Decorative metal. (Elective).

Decorative Metal for the Junior or Senior High School

Third and Fourth Years. Industrial and Home Drawing and Design. Girls.

1. History of handicraft. Its development.
2. Principles of design applied to the costume and home. Summary of the work of the first two years, notebook illustrations of good design in costume, including millinery, household utensils and similarly related material.
3. Home furnishing; selection of a room or house for actual practice.
4. Harmony of color.
5. Dyeing. Wood staining.
6. Design applied to crafts work in copper and silver.
7. Quick freehand sketching from oral description.
8. Decorative metal, (elective).

THE RURAL HIGH SCHOOL COURSE

It is obvious that, except in the consolidated rural high school of considerable size, industrial arts cannot be organized in the rural high school upon the physical bases described for the urban and city high school. The size of the school and the possibilities of securing equipment make this impossible.

In the consolidated school, however, there may be opportunities equal with those of the small city school to differentiate courses in the early high school period and to give special courses thereafter. If this is true, the special courses will be designed largely to prepare for rural conditions, both of the home and community type. Such courses would be:

COURSES FOR GIRLS

Plain sewing by hand
Plain sewing by machine
Home millinery
Made over garments
Home cooking
Home keeping
Canning and preserving
House decoration

COURSES FOR BOYS

Farm mechanics
Farm woodwork
Concrete construction for the farm
Carpentry
Reading and making simple drawings

In the average rural high school, however, conditions under which industrial arts are given will approximate those of the smallest urban community. Very little special equipment will be provided, and, unless instruction is organized on the circuit plan, that is, by having a special teacher go from one high school to another in a group of from two to four or five communities each week, the instruction in industrial arts will be given by the principal or by some regular teacher of academic studies who has had some preparation (usually slight) in industrial arts.

Under either of these conditions the instruction given will likely be general rather than specific, due to the character of preparation

A Typical Farm Interest Problem for Rural Schools

of the instructor. If this is true, strictly vocational courses in the later high school years will be out of the question. Nevertheless, by cooperating with some mechanic in the community or by working out a scheme of home project work on the farm much may be done to continue practice in some particular direction, such as canning, preserving, home cooking or sewing by the girls, or carpentry, farm mechanics or concrete construction by the boys, to make the work near-vocational if not quite vocational in character.

In the early high school period it will be impossible to offer a wide variety of industrial work in the form of separate unit courses. One of the two following plans of making the work varied in character and yet having it apply to the rural community is, however, possible.

General Occupation Plan

This will be similar or the same as that discussed for the Middle or Intermediate Grades except that more advanced work may be done and occupations may be entered which would not be possible for younger children. If a shop for boys or home making room for girls is fitted up with essential tools and equipment for the chief work which is needed to be done in the house and out of it on a farm, and if the interest of the fathers and mothers of the community is aroused, there will be no end to the problems which the freshmen and sophomores as well as older classmen can help to solve.

POSSIBLE PROBLEMS FOR GIRLS

1. Care of own room.
2. Care of bedrooms.
3. Sweeping and dusting on Saturdays.
4. Preparation of morning or evening meal.
5. Washing, wiping and putting away dishes.
6. Making simple garments.
7. Making curtains or draperies.
8. Arranging furnishings for room.
9. Planning decoration for room.
10. Cooking certain articles from time to time.

POSSIBLE PROBLEMS FOR BOYS

1. Construction of garden and farm apparatus.
2. Construction of playground apparatus.
3. Construction of kitchen and home conveniences.
4. Making useful articles of concrete such as: hitchweight, carriage step, walk, etc.
5. Construction of simply framed projects such as: dog house, chicken house, garage, cornerib, etc. (This work would doubtless need to be done in cooperation with and under direction of someone in the community.)
6. Repair work on home projects as: furniture, windows, painting, etc.

Industrial Unit Plan

Following more or less closely the plan of organizing industrial work in a junior high school, and depending upon the fitness of those who are available or may be secured to give instruction, the small rural high school may offer courses in each of a few rather definite industrial lines of work. Equipment which is not specialized in character, extensive or expensive, may be provided to make possible the giving of courses to the few who will elect them.

FOR BOYS

Carpentry, cement and concrete construction.

Repair and operation of farm machinery.

Brick laying, painting, etc.

Any one of these may be either subdivided or extended for further work in later high school years.

FOR GIRLS

Plain sewing, machine sewing, garment making, embroidery, millinery.

Cooking (in its several branches), preserving.

Sanitation of the home.

Decoration of the home.

POSSIBLE PROBLEMS IN DRAWING AND DESIGN

Boys. 1. Freehand drawing of parts of farm machinery, drawings of missing parts with dimensions.

2. Freehand sketches for desirable data connected with nature study and agriculture.

3. Design applied to concrete construction of urns, flower boxes, cement street lamps, hitching posts.

4. Landscape planting for farmhouses.

5. Color schemes for painting farmhouses and schools, painting and staining for wood interiors.

6. Designs for rural school gardens.

7. Good taste in clothing, pictures, furniture, etc.

Girls. 1. Freehand sketches in connection with botany and agriculture.

2. Freehand sketches showing seed dispersals.

3. Plan and elevation of room. Estimates of wall surface.

4. Color scheme for single room; for a suite. Estimates of cost of decoration.

5. Dress design, including millinery.

6. Designs for rural school gardens.

7. Good taste in dress, pictures, furniture, etc.

THE INDUSTRIAL SCHOOL COURSES

It is quite possible that the organization and maintenance of industrial arts as previously suggested for the different parts of the regular school system will effect similar work in industrial schools in several ways, as follows:

1. It may reduce the number of permit and all-day pupils, due to the attractiveness of industrial work in the middle grades and upper grammar grades tending to hold pupils in the regular schools.

2. It may make perfectly feasible the utilization of one equipment for both regular school and industrial school pupils. This may be true for apprenticeship and extension classes as well as others.

3. It should make possible, providing pupils are retained in regular schools for a longer period of time, the giving of more

specialized courses and consequently more vocational types of work in the industrial schools.

It is not anticipated that the reorganization of industrial arts in regular schools will make the continuation industrial school unnecessary. It should be hoped, however, that such schools will have a larger opportunity to do the industrial work peculiarly adapted to the needs of their pupils if the redirection and reorganization of industrial arts in the regular schools will mean fewer pupils in industrial school classes or fewer classes to be provided. This should improve the instruction and administration of industrial school work. Permit and all day industrial school pupils may be given more individual attention; apprenticeship pupils may be given the work which supplements their elected trade work and more emphasis may be placed upon the work of trade preparation and extension in evening classes. This should all tend to raise the standard and efficiency of the industrial school by making possible one of its peculiar and essential aims, namely, to deal individually with those who have left school to work but who by law must be given further school opportunities or by choice desire facilities for extended work in school.

CONCLUSION

We may conclude from the foregoing that the industrial arts, conducted under regular public school conditions, may be changed materially, both in content and method of teaching, from past practices.

Changes advocated should result in:

1. Drawing and design taught as an integral part of all construction work, carried on for whatsoever purpose. These subjects may and should be developed by regular grade teachers in the primary grades. They may well be taught by special teachers working in close cooperation with the industrial teachers above the primary grades.

2. All forms of public school handwork in the primary grades taught as one subject, the industrial arts, and principally as a means of expression and as an interpretation of the industrial world.

3. Industrial arts above the primary grades given increasing vocational emphasis without interfering with the organization of subject matter or method of teaching to make them strongly an educative means.

The means to effect changes are:

1. Primarily expressional and secondarily technical construction work in the primary grades.

2. Freehand and mechanical drawing and design taught as part of construction work and primarily for appreciative values, in the primary grades by regular grade teachers under the direction of one supervisor.

3. Large muscle home and community occupational work in the middle grades.

4. Drawing, design and industrial arts regarded as separate sub-

A College Standard but Indicative of the Possible Individual Development of Special Creative Ability

jects above the primary grades, each taught by a special teacher, all of whom cooperate to develop subjects as a unit for appreciative values but each to develop particular subjects for technical value in cases where individuals show special creative, technical or vocational abilities.

5. A differentiated course of study in the upper grades and early high school years based on the junior high school organization of unit industry courses.

6. Specialized curricula opportunities and equipment facilities, beginning with the high school, increasing in number throughout the high school period.

7. An increased amount of time for industrial art subjects above the primary grades—not less than two double periods per week in the middle grades, one double period per day in the junior high school grades and from this amount to one-half day, five days per week thereafter.

8. Cooperation with home, community and industrial agencies in securing services of experts in special fields of effort and in giving pupils opportunity for part time work in them.

In a word:

1. Industrial arts in the primary grade should be regarded as a part of the means of instruction.

2. Industrial arts in the middle grades should serve to acquaint the pupil with the big problems and their chief aspects in the world in which he lives.

3. Industrial arts in the junior high school grades should give varied industrial practice and offer a fund of industrial information sufficient to give valuable citizenship training and vocational choice.

4. Industrial arts in the high school should aim to prepare individuals for vocational service while offering general educational opportunities for all, at least through the first two years of a high school course.

BIBLIOGRAPHY

ADVANCED MECHANICAL DRAWING

Blessing and Darling. *Elements of Drawing.*

Phillips and Orth. *Mechanical Drawing for Colleges.* Scott, Foresman and Co., Chicago, Ill.

Jamison, A. P. *Advanced Mechanical Drawing.*

ADVANCED WOODWORK

Crawshaw, F. D. *Problems in Furniture Making.* Manual Arts Press, Peoria, Ill.

Furniture Design for Schools and Shop. Manual Arts Press.

Griffith, Ira D. *Woodwork for Secondary Schools.* Manual Arts Press.

Noyes, Wm. *Handwork in Wood.* Manual Arts Press.

ARCHITECTURAL DRAWING

Babbitt, A. B. *Working Drawings.* Henry Holt & Co., Milwaukee, Wis.

Edminster, C. F. *Architectural Drawing.* Published by the author, Pratt Institute, Brooklyn, N. Y.

Greenburg and Howe. *Architectural Drafting.*

CARPENTRY

Griffith, Ira S. *Carpentry.* Manual Arts Press.

Raehl, L. M. *Problems in Carpentry.* Bruce Publishing Co., Milwaukee, Wis.

CEMENT AND CONCRETE

Course of Study in Cement and Concrete. Portland Cement Co., Chicago, Ill.

Radford, W. A. *Cement and How to Use It.* Radford Arch. Co., Chicago, Ill.

CLAY WORK

Binns, C. F. *The Potters Craft.* Van Ostrand & Co., New York City.
Cox, G. J. *Pottery.* Manual Arts Press.

DESIGN

Batchelder, E. A. *Design in Theory and Practice.* Macmillan Co., New York City.
Chase, J. C. *Decorative Design.* John Wiley and Sons, New York City.
Dow, A. W. *Composition.* Manual Arts Press.
Izor, E. P. *Costume Design and Home Planning.* Atkinson, Mentzer & Co., Chicago, Ill.
Lawrence and Sheldon. *Use of the Plant in Decorative Design.* Scott, Foresman & Co., Chicago, Ill.
Varnum, W. H. *Industrial Arts Design.* Scott, Foresman & Co.

ELEMENTARY HANDWORK

Bean, Florence O. *Bookbinding for Beginners.* School Arts Pub. Co., Boston.
Buxton & Curran. *Paper and Cardboard Construction.* Manual Arts Press, Peoria, Ill.
Dabbs, Ella V. *Expressional Handwork.* Macmillan & Co.
Primary Handwork. Macmillan & Co.
James, G. W. *Practical Basket Making.* Manual Arts Press.
Johnson, Ben W. *Coping Saw Work.* Manual Arts Press.
Lester, Katherine M. *Clay Work.* Manual Arts Press.
Mickel, Adelaide. *Leather Work.* Manual Arts Press.
Miller, Chas. M. *The Construction and Flying of Kites.* Manual Arts Press.
Sage & Coolley. *Occupations for Little Fingers.* Chas. Scribners Sons.
Seegmiller, W. *Primary Handwork.* Atkinson, Mentzer, & Grover, Chicago.
Wathe, Phipp Todd. *Hand Loom Weaving.* The Author, Minneapolis, Minn.

ELEMENTARY MECHANICAL DRAWING

Bennett, Chas. A. *Mechanical Drawing for the Grades.* Manual Arts Press.

Crawshaw and Phillips. *Mechanical Drawing for Secondary Schools.* Scott, Foresman & Co.

ELEMENTARY WOODWORK

Griffith, Ira D. *Correlated Courses in Woodwork and Mechanical Drawing.* Manual Arts Press.

Essentials of Woodworking. Manual Arts Press.

Noyes, Wm. *Design and Construction in Wood.* Manual Arts Press.

FOODS AND COOKERY

Greer, Edith. *Food, What It Is and Does.* Ginn & Co., Chicago, Ill.

FORGING

Bacon, John D. *Forge Practice.*

Littlefield, James D. *Notes on Forge Shop Practice.* Taylor, Holder Co., Springfield, Mass.

Richards, Wm. A. *Forging of Iron and Steel.* Wiley & Sons, New York City.

FOUNDRY

Palmer, R. H. *Foundry Practice.* Wiley & Sons, New York City.

Tate and Stone. *Foundry Practice.* Wilson Co., Minneapolis. Minn.

FREEHAND DRAWING

Applied Arts Drawing Books. Atkinson, Mentzer & Co., Chicago.

Cross, A. K. *Light and Shade.* Ginn & Co., Boston, Mass.

Daniels, F. H. *School Drawing, a Real Correlation.* Milton Bradley Co., Springfield, Mass.

Industrial Arts Drawing Books. Prang Educational Co., Chicago.

HOME MAKING

Kittredge, Mabel H. *Practical Home Making.*
Parloa, Maria. *Home Economics.* Century Co.
Perie. *The Science of Homemaking.* Scott, Foresman & Co.
Richards and Elliott. *The Chemistry of Cooking and Cleaning.* Whitcomb Barrows Co., Boston, Mass.

MACHINE DRAWING

French, T. E. *Engineering Drawing.* McGraw, Hill & Co., New York City.
Law, D. A. *Introduction to Machine Drawing and Design.* Wiley & Sons.

MACHINE SHOP

Calvin & Stanley. *Machine Shop Primer.* McGraw, Hill & Co.
Kaup, W. J. *Machine Shop Practice.* Manual Arts Press.
Smith, Robert H. *Advanced Machine Work.* Manual Arts Press.

METAL WORK (ART)

Googerty, T. F. *Art Smithing.* Bruce Publishing Co., Milwaukee, Wis.
Payne, A. W. *Art Metal Work.* Manual Arts Press.
Rose, A. F. and Cirino, Antonio. *Jewelry Making and Design.* Metal Crafts Pub. Co., Providence, R. I.
Wilson, H. *Silverwork and Jewelry.* Appleton & Co., New York.

METAL WORKING (INDUSTRIAL)

Adams and Evans. *Metal Work.* Manual Arts Press.
Attans, E. A. *Practical Sheet and Plate Metal Work.* Manual Arts Press.
Crawshaw, F. D. *Metal Spinning.* Manual Arts Press.
Weber, Walter B. *Problems in Electrical Construction.* Manual Arts Press.

PATTERN MAKING

Purfield, Horace T. *Wood Pattern Making.* Manual Arts Press.
Turner & Tawn. *Pattern Making.* Manual Arts Press.

PERSPECTIVE

Mathewson, F. E. *Perspective Sketching from Working Drawings.* Taylor Holden Co., Springfield, Mass.
Norton, D. M. *Freehand Drawing and Perspective.* Published by the author, care of Pratt Institute, Brooklyn, N. Y.

PRINTING

Gress. *American Handbook of Printing.* Oswald Publishing Co., New York City.
Vaughan, S. J. *Printing and Bookbinding.* Manual Arts Press.

TEXTILE ARTS

Gibbs, Charlotte M. *Household Textiles.* Manual Arts Press.
Hughes, Talbot. *Dress Design.* Manual Arts Press.
McGlauflin, Isabelle. *Handicraft for Girls.* Manual Arts Press.
Woolman, Mary Schenck. *A Sewing Course.* Manual Arts Press.

WOOD TURNING

Crawshaw, F. D. *Problems in Wood Turning.* Manual Arts Press.
Ross, S. A. *Elementary Wood Turning.* Ginn & Co.
Selden, Frank H. *Elementary Turning.* Rand McNally & Co.