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Correlated courses in woodwork and mechanical drawing

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PREFACE.

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The author wishes to state that the basis of the following courses rests more upon the art or practice of teaching manual training than upon the theory. It is the result of carefully prepared plans executed under public school conditions by the author himself, covering a period of some nine years of experimentation. Wherever plans, or theory,

were found producing results which common sense indicated plainly were not for the pupils' highest good, practical expediency supplanted theory.

If manual training practice in the two upper grammar grades has merited criticism it has been because school men have not taken its subject matter seriously enough.

It is too much to hope that results can be achieved that are truly educative, when a shop, however well equipped, is turned over to a teacher but slightly experienced in, and appreciative of, the "finer points" of the subject matter to be dealt with. Loose and unorganized efforts in any line of work cannot become educative, it matters not what fine spun theories may be offered as proof to the contrary. Indeed, much positive injury may be done.

If the present demand for vocational training teaches manual training anything, it is that the subject matter of manual training must receive more serious attention. The aims of manual training and vocational training, in one sense, are not so very different; both seek, or should, to assist the boy to become a "thinking doer." The distinction is mainly a matter of "direction" and of allotment of time, with possibly a slight difference in the placing of the emphasis on one or the other of the words "thinking doer."

We do not mean to imply that manual training and vocational training are the same, but we do mean to say that the educative value of any shop training, whether given from the point of view of general culture or of special preparation for life's work, is evidenced in the attitude which pupils are allowed to assume toward their work. Incorrect and slovenly habits of thinking and doing have no

more place in manual training than in vocational training. Organization of subject matter is as essential in manual training as in any other line of endeavor.

Among other things, it is the author’s hope that the book may offer some suggestions that will help to bring about a better understanding of the relation of the high school and grade school manual training. The arrangement and division of the subject matter and the grouping of the problems represent one method of attack.

The employment of skilled instructors in both grade and high school and the making of the work of the upper grammar grades serious mechanically rather than merely “expressional” will wait in many communities upon the initiative of the school authorities.

Normal school students will find the outline representative of a manual training practice that is being carried on in some schools that are reputed to be progressive.

Finally, it is expected that the book will prove helpful to young instructors in their first year of teaching, assisting them over many of the petty details which spell success or failure in varying degree, which otherwise would not be foreseen.

IRA S. GRIFFITH

Oak Park, Ill., June, 1912.

For the convenience of the teachers, the drawings used in “Projects for Beginning Woodwork and Mechanical Drawing” and “Advance Projects in Woodwork” are printed in this book. The notes and working directions, however, are

not included. The inking of the drawings and the making of the perspectives in both of these books is the work of Mr. George Gordon Kellar.

PART I.
ORGANIZATION.

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CHAPTER I.
FOREWORD—AIMS

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Foreword.

It is assumed that woodworking and mechanical drawing have subject matter and that it is desirable to have an orderly arrangement. Such an assumption may seem unwarranted to some—to those who labor in private institutions where the instruction is individual or nearly so. It is believed, however, that to teachers of these subjects in the public schools, where for economic reasons, classes of considerable numbers must be cared for, the necessity for a careful selection and arrangement of subject matter is very evident.

It has taken some years for the manual training movement to recover from the extremes into which the late psychology and child study movement had led it. The exaltation of the “individual” and the reign of the “self-expressionist,” it would seem, is about over. Not that this latter movement was an evil—far from it. Its influence was needed and came none too soon. Like other great movements, however, it led some teachers to extremes, causing them to overlook the good in the old with the result that the new alone has proven no more desirable than the old alone. The pendulum of opinion is returning and in not a few important places, is already swinging to the other extreme. It is for manual training teachers to try to

determine by an exchange of ideas where the sanest position lies.

In this discussion, we should ever keep in mind that the American public school system is maintained mainly to prepare boys and girls for good and useful citizenship; that this is a democracy in which neither individual nor class is to be exalted unduly and that our system of education must result neither in the chaos of anarchy nor in the dull formalism of a despotism. To the writer it appears that manual training as practiced before the psychologist took possession was quite typical of the countries from which its influence came, Russia and Sweden-formalism. Under the influence of the most radical of the psychologists, manual training became synonymous with educational anarchy.

The best American citizenship cannot be developed by means of either the new alone or the old alone. There must be due attention paid to the development of the individual but that same individual must learn that he is but one of many and that he must do some things because they make it possible for all to enjoy equal rights and privileges. With this thought in mind, irrespective of any consideration of economic advantages, orderly arrangement of subject matter and class instruction, made necessary in large schools, must be looked upon as helpful rather than harmful in the preparation of the individual for citizenship.

Superintendent L. D. Harvey has said:

Members of society may be roughly classed into four groups: those who think without doing; those who do without thinking; those who neither think nor do; and those who think and do because of their thinking. This fourth class

comprise the productive, constructive, organizing element of society. It is the function of the public schools to produce members of this fourth class. It must be evident to all that for the production of a thinking and doing individual the two forms of activity should be carried on side by side; the doing growing out of the thinking, and the thinking made clear and definite thru the doing.

In this statement the writer sees the proper relation of those two essential elements that make manual training valuable as a school subject—the thought element and the element of skill. Manual training suffered by having the one —skill—unduly emphasized when our European importations were made. Recently, it has suffered by having the other—the thought side—unduly magnified. Both of these elements are important.

In the author’s experience the practical application of a system that would make the most of each of these elements has been a source of no little disappointment. Effort in one direction seemed always to result in a sacrifice in the other. That is, when the thought side was emphasized there was a falling off in the accuracy of the results. When skill was magnified it was attained only with a sacrifice of the thought element. With many misgivings the conclusion was reached that the introduction of original thinking on the part of the pupil must mean somewhat of a sacrifice on the skill side. Concerning this phase of the subject Professor Richards writes:

In order to develop in the highest degree independence of thought and power of initiative the pupil must be given opportunities for determining ends and working out means.

Only in this way is the natural cycle of mental activities—thinking, feeling and doing—fully realized and made effective. The practical realization of this principle means, of course, a distinct problem of instruction. The problem is essentially one of proportion and balance between freedom of expression on the one side and skill and mastery of process on the other. Extreme emphasis on the one leads inevitably to a class of crude and ill-considered products while attention restricted to the other results in mere drill and formalism.

Further, in "THE MANUAL TRAINING TEACHER," Charles L. Binns, an Englishman just returned from a trip thru the United States, writes of manual training in the grades as follows:

The lack of exactness is the main defect of American manual training. But there are many compensations to be balanced against this, and these arise chiefly, in my opinion, from the fact that the teacher is allowed more liberty to follow his own judgment in teaching the subject than is the case here. He has more scope for exercising his initiative, with the result that he retains the freshness of interest and enthusiasm for his work that our own stereotyped and restricted schemes do much to quell. There is a fine spirit of free activity, eager interest, and industry permeating most of the manual training classrooms. Even the inferior work is done with a happy glow of achievement that half excuses it. * * * To emphasize unduly the aim of rigid mechanical accuracy generally means a sacrifice of the thought side of the work. Those qualities which lead eventually to the realization of the pupil's highest powers—such qualities as intelligent self direction; an alert resourceful attitude of

mind; and power to plan means to an end—are too valuable to lose for such an aim. * * * At the same time a system of handwork that ignores a reasonable standard of accuracy does not count for much. In the course of my visits I found more than once not only an almost entire disregard for exactness in the work of the boys, but also an almost entire neglect on the teacher's part to strive for it. Something may be said for a method which grants the pupils liberty to express themselves freely in their work, if the results are critically examined and the errors pointed out, but to accept and pass complacently work manifestly inferior is quite inexcusable. There is an element of haste about some of the work which may account for some of this.

More recently Dr. Georg Kerschensteiner the eminent German authority of Munich while on a tour of the United States is quoted by the "MANUAL TRAINING MAGAZINE" as criticising our manual training strongly, saying:

He could not see why children are encouraged to make big pieces of furniture before they can square up a piece of wood properly or make a single joint of the type that must be multiplied many times in the piece of furniture, if it is properly constructed. From this statement it must not be concluded that his pedagogy is of the dried out kind. On the contrary he stated with marked emphasis that the first requisite in training for skill is to cultivate joy in work. "It is in that way that we appeal to the heart," and "it is only when the feelings are brought into action that we can most truly educate."

We may conclude from this brief statement of the situation that it is desirable to organize and have courses in

our manual training and mechanical drawing and that whatever system is adopted it must make allowance for emphasis upon both the thought element and upon skill.

What System Shall We Use.

It is pretty generally conceded that manual training as exemplified by the Russian system of joint making and the Swedish system of model making fails to lead forth the powers of the child to the fullest extent. The educational theory, now generally accepted, that interest is the indispensable basis of every method of education is sufficient to condemn the Russian system so far as its application in non-technical schools is concerned, while Swedish Sloyd, unmodified, is weak in that it fails to take into account the reflective phase of interest, namely, the power of self-initiative. Extreme “educational manual training’s” greatest weakness lies in its undue emphasis upon the thought element resulting in too great sacrifice of that other equally important element, skill or accuracy. The manual training movement is to be congratulated in that all signs now seem to point to its speedy delivery from the hands of these latter extremists. Is it too much to hope that out of our past experiences with the joint making Russian system with its admitted disciplinary value, the Swedish model making with its effort to utilize the energy of the worker toward useful products, and the self expression of the pedagogical movement with its attendant elements of interest and initiative there may come a manual training practice that shall be marked by a combination of the best

of these elements with a consequent elimination of the weaknesses of each?

The outline of study suggested in the Illinois State Course of Study, credit for which is due mainly to Professor Charles A. Bennett, the chairman of the committee on manual training in woodwork, has proven a source of very great help to the writer in his efforts to properly present the subject matter of woodwork to his pupils. The introduction to this course is well worth repeating and is in substance as follows:

Any course in woodworking worthy of a place in the eighth and ninth grades of public school work should meet the following requirements:

1. It should arouse and hold the interest of the pupils.

2. Correct methods of handling tools should be taught so that good technique may be acquired by the pupils.

3. Tool work should be accompanied by a study of materials and tools used in their relations to industry. Special attention should be given to the study of trees—their growth, classification, characteristics and use.

4. Drawing should be studied in its relation to the work done.

5. The principles of construction in wood should be taught thru observation, illustration and experience.

6. At least a few problems should be given which involve invention or design or both, thereby stimulating individual initiative on the part of the pupils.

The course is arranged in groups, each group representing a type of work. These groups are given in the order of procedure. The teacher is expected to provide

problems of the greatest value educationally. This means that the things to be made should be worth making and that the process of making them should be interesting to the student.

From this it follows that the things to be made must come to the pupil in an order which gives reasonable consideration to the difficulties to be encountered in making them.

Our outline will aim to present the work so as to meet the conditions specified above. It has been thoroly tested over a period of years in public school work. It follows the group plan. The advantages of the group system are distinct. It permits class instruction and therefore minimizes the amount of demonstrating and talking that the instructor must do by preventing needless repetition. By grouping a number of projects having similar tool operations it permits a boy to satisfy his individual needs without interfering with the orderly presentation of the subject matter. It provides work for the fast worker of an interesting and profitable nature until the slow worker completes the minimum requirement. It provides for the “repeater,” who often has to repeat, not because of poor work in manual training but because of poor work in academic studies, by giving him choice of different models upon which to work. In general, the group plan possesses the manifest advantages of class instruction at the same time making allowance for the individuality of the worker.

CHAPTER II.
CLASSIFICATION AND ARRANGEMENT OF TOOL OPERATIONS FOR GRADES 7, 8, 9, AND 10.

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WOODWORK. GRADE VII.

Time: 2½ hours per week.

GROUP I. Squaring up Mill-planed Stock. (No definite dimensions but to be square and as large as the stock will allow.)

Time: 1 week.

Stock	Processes	Tools	Projects
Soft wood S-2-S ¾″ × 6″ × 12″	Edge planing Testing for uniformity of width End planing	Jack-plane Try-square (Block-plane?)	Cutting-board

GROUP II. Squaring up Mill-planed Stock. (Definite dimensions.)

Time: 3 weeks.

Soft wood S-2-S ¾″ × 4¼″ × 10½″	Surface smoothing Gaging Measuring Lining Back-sawing (parallel to	(Smooth plane?) Marking-gage Rule Knife Back-	Counting-board Hat-rack Key-rack

¾″ × 2¾″ × 18½″	line) Boring Chamfering	saw Brace and bits Pencil-gage	

GROUP III. Squaring up Rough Stock.

Time: 4 weeks.

Soft wood Rough 1″ × 8″ × 8″	Surface leveling, etc. Crosscut-sawing Rip-sawing Sandpapering	Straight-edge Winding sticks Crosscut-saw Rip-saw	Ring-toss Spool-holder Game-board Laundry-register

GROUP IV. Working Curves.

Time: 3 weeks.

Soft wood S-2-S ¾″	Getting out stock Curve sawing First use of chisel? Spokeshaving	Steel square Turning-saw Chisel? Spokeshave	Sleeve-board Bread-board Cake-board Scouring-board Coat-hanger

GROUP V. Fastening with Nails and Screws. Duplicate Parts.

Time: 6 weeks.

Soft wood S-2-S	Duplicate parts Nailing	Hammer Nailset Screwdriver	Nail-box Polishing-box

⅜″, ½″, ¾″	Setting nails Fastening with screws		Knife-box Bird-box Broom-holder Bench-hook

GROUP VI. Appreciation in Design. Structural, Decorative.
Time: Remainder of school year.

Soft wood S-2-S ⅜″, ½″	Structural design Decorative design Outlining Staining Waxing	Stains Brushes Wax	Table-mats Thermometer-back Calendar-back Letter-holder Bill-file Handkerchief-box Glove-box

GRADE VIII.

Time: 2½ hours per week.

GROUP VII. Groove Joints. Woodfinishing.
Time: 12 weeks.

Stock	Processes	Tools	Projects
Exercise piece Soft wood close grained 3¼″ × 10½″ Any	Exercise—Chiseling grooves Sawing to fit Fitting parts Applications —	Chisel Mallet	Exercise piece Book-rack Necktie-rack Magazine-rack Foot-stool

thickness to reduce to ¾″. Application — Chestnut, S-2-S ⅜″, ¾″, 1″.			Wall-rack Wall-shelf Desk-shelves Square taboret Stool

GROUP VIII. Cross-lap Joint.
Time: 12 weeks.

Exercise piece— Soft wood, close grained 1¾″ × 10½″ Any thickness to reduce to ¾″. Application — Chestnut, S-2-S ⅜″, ¾″, 1″.	Exercise— Cross-lap joint Applications	Glue Hand clamps	Exercise piece Book-trough Cluster drop-light Desk-light Calendar-mount Hall-rack Picture-frame Octagonal taboret Plate-rack Pedestal

HIGH SCHOOL.

GROUP IX. Joinery. Board and Framed Structures. (Accompanied by Mechanical Drawing ¾ hour per day.)

(Time: 1½ hours per day.) (18 weeks.)

Stock	Processes	Tools	Projects
Close grained wood Rough or Mill-planed ¼ sawed White oak S-2-S	Exercises— Mortise-and-tenon, keyed, blind Miter Modeling Glue joint Applications —	Jointer Smooth-plane and full tool set. Individual edge tools, irons and chisels, if possible Band-saw Jig-saw	India stool Umbrella-stand Taborets Arm-chair, (simplified) Side-chair, (simplified) Leg-rest Magazine-stand Small tables Book-trough Piano-bench Foot-stools Telephone-stand and seat, etc. etc.

(Benchwork in Metal 18 weeks.) (Accompanied by Freehand Drawing and Design ¾ hour per week.)

GROUP X. Cabinet-Making. Paneled Structures. (Optional and on a par with other advanced courses in shopwork.) (36 weeks.)

Various woods	Exercises— Drawer construction Door construction	Combination plane Band-saw Circular saw Jointer,	Music-cabinet Chafing-dish stand

Hinging Locking Applications —	machine Planer, machine Mortise machine Shaper Jig-saw	Desks, Tables Book- cases Chests, Screens Clocks Shaving- stand Beds, Settee Porch- swing Mission chairs Medicine- case Dressers, etc. etc.

Note—Freshmen boys will be divided into two divisions. The first will take Joinery the first semester, and second division will take Metalwork. The second semester these divisions will exchange shops.

Discussion of Woodwork Course.

Column one describes the condition of the stock when given the pupil. Column two names the new principles involved in the construction of the articles.

In Group I. stock mill-planed upon two surfaces to the thickness wanted is given the pupil and he is required to square it up. No definite dimensions are demanded but the class is given to understand that the best workman is he

who can square up his piece with the fewest shavings removed. The gage is not used on this piece. The uniformity of width is determined by the sliding try-square test. The broad surfaces are not worked by the pupil at all in making this piece. In the first place, the use to which the piece is to be put demands no fine surface treatment. In the second place, experience shows that it is advisable to make this first piece as simple as possible and pupils, at least grammar school pupils, learn to handle the plane better on edge planing than on surface planing.

An examination of the headings of the groups suggested for seventh grade, and the directions given in connection with the problems will show that each of these groups introduces a new method of squaring up stock. For illustration, Group I is typical, as to the surface treatment, of the method used by carpenters and others in preparing outside finishing material such as cornice and window and door casings, corner boards, etc. Here mill-marks are not considered objectionable so that neither broad surface is worked. Group II is typical, as to the surface treatment, of the method of preparing interior wood trim. One surface is planed smooth, and straight as to its width, but no effort is made to take out the wind, nor is the back surface treated at all. Again, certain kinds of shelving and box construction require that both broad surfaces be smoothed of their machine or mill-marks but do not require either surface to be true, depending upon the manner of fastening the parts together to take out any unevenness. Group V typifies this method of treatment. Of course, if the stock is badly curled or cupped no attempt is made to use it for the thickness for

which it was originally intended, tho it is possible to “nail out” pretty badly warped boards on certain kinds of carpentry work. In furniture making this is hardly ever possible or advisable. A sleeve pressing board does not require a face edge or square ends, etc., Group IV. Group III typifies the standard treatment of which these others are modifications.

In the third column tools necessary for performing the process are named. In elementary woodwork the block-plane and smooth-plane may be omitted, the jack-plane doing the work just as well.

In the Lesson Outlines, section numbers of a text on woodworking to which the student is referred are given. The text to which the numbers refer is “*Essentials of Woodworking*.” The necessity for a text to accompany but not to take the place of the demonstration is well appreciated by most teachers of manual training. With a text in the hands of each pupil a lesson may be assigned and the pupil required to familiarize himself with the text and the illustrations relating to the subject matter. The use of a text removes most effectually the necessity for a constant repetition of oral instruction. With a text there is never any excuse for the pupil bothering the instructor with the otherwise semi-valid excuse of “I forgot” or “I was absent when the demonstration was given,” etc., etc.

In Groups VIII and IX will be found exercise pieces. One of the advantages claimed for the group system is that it permits class instruction at stated intervals, thus reducing individual instruction to a minimum. For illustration, a class beginning Group II would continue to work upon the

problems of that group until all but the few acknowledged failures had completed the work required in that group. After this the class is to be instructed in the new things of Group III. This plan to continue thruout the whole course.

The work of the groups will of necessity overlap each other. For, as soon as a pupil finishes one problem in a group, he begins another problem in the same group, unless he is the slowest in the class. When the class is ready to begin a new group we are confronted with the question of whether to give the instruction belonging to the new group and allow the boys to proceed with the unfinished work of the old group, or to start them on problems of the new group. To proceed with the old is objectionable in that the worker forgets his new instruction before he has opportunity to apply it. To start new work before finishing the old is bad in that the pupil will have lost interest in the old when asked to complete it after finishing the new work. Not to complete the old at all would be a practice too vicious to be tolerated for a moment.

In the seventh grade this overlapping is not a serious problem, for the objects being small and quickly finished allow all to finish the old group before the instruction of the new has faded. In the eighth grade and high school, however, where the objects are larger, this objection is a serious one.

As stated before, the aim of the group arrangement is to permit class instruction at the beginning of each group. To make this effective the practice and application must follow within a reasonably short time. Here the “exercise” offers aid.

If ever an exercise piece has a legitimate use, it has it here. The great objection to exercise pieces lies in their inability to create a vital interest on the part of the pupil. The writer has made it a practice to talk over the applications of each exercise and to state briefly the need for the exercise before beginning it. First, that the class because of numbers must be instructed all at the same time; second, that the joints, unlike the simple one-piece objects previously made cannot be remedied or patched up by reducing the size, as in the bread board, when lack of knowledge or skill causes errors; third, that postponing the practice any length of time would be unwise. As the time required for making the exercises, as arranged in the course outlined above, is short there has never been a lack of interest either in the exercise or in the unfinished objects of the old group to which some must return after completing the exercise.

High school boys begin to take on a different attitude toward exercises and technique. Their increased knowledge and skill permit applications requiring considerable time for completing. For this reason all the exercises are grouped in the fore part of their year.

To the writer it seems unnecessary to apologize for this use of exercises. He has felt free to utilize parts of any system which seemed to serve his purpose. He does feel, however, that a long continued series of exercises in elementary woodworking without application would be fatal. American school methods have been criticised by Europeans as being superficial and lacking in thoroness. It may be that in our eagerness to develop the individual we

have made ourselves subjects for such criticism to a certain extent. We need not fear the introduction of this small amount of drill and formalism, especially when there is no loss of interest or incentive. It is impossible to teach a pupil a thing that is entirely new to him unless he has in his possession a fund of “known” thru which the unknown may be made known. For this reason drawings and sketches are plentifully provided.

Experience has shown that better results are obtained, both in the development of ability to think and ability to do, if the ability to “do” is given a maximum of attention at the beginning of the course, opportunities for original thinking being introduced gradually as the pupils’ knowledge, appreciation, and skill increase. In the beginning groups the sizes or dimensions are fixed, no variation being permitted except as poor work necessitates. Requiring all to make the same pieces in the beginning groups permits comparison of results and the establishing of standards of accuracy as well as making it possible to give definite instruction with the minimum of talking.

Another reason for emphasizing technique and processes at the beginning is that interest is so easily directed. A beginner is interested in anything. In fact, a few exercises—not more than two or three—might be introduced at the very beginning without in any way violating the principle relating to interest previously mentioned. The writer does not make use of exercises in this way but can understand some of the advantages secured by so doing.

Having taught the pupil to respect a “working line,” which experience shows takes the greater part of the