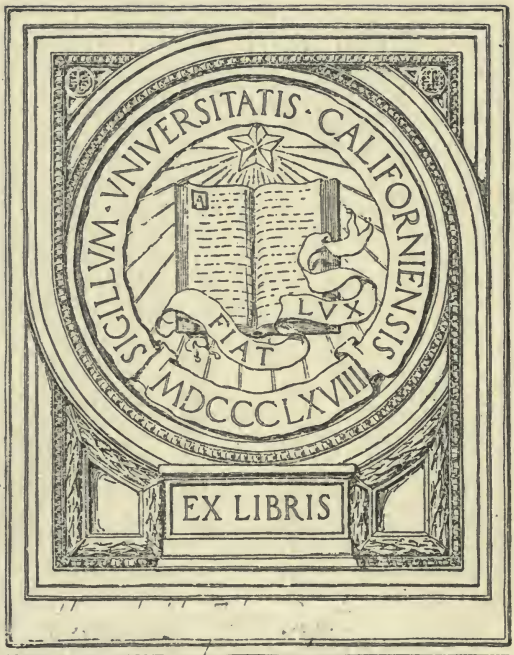
TEACHING MANUAL AND INDUSTRIAL ARTS

GRIFFITH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TEACHING MANUAL AND INDUSTRIAL ARTS

A TEXTBOOK FOR NORMAL SCHOOLS AND COLLEGES

BY

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THE MANUAL ARTS PRESS

PEORIA, ILLINOIS

Second Edition, 1921

Printed in the United States of America

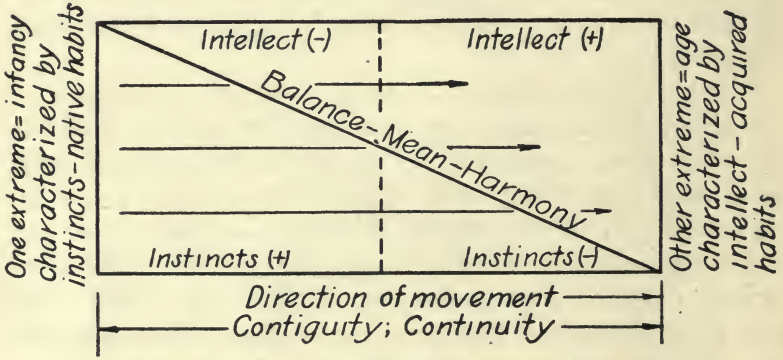
PREFACE

Teaching Manual and Industrial Arts is intended as a text for use in normal schools and colleges. Its primary aim is to assist in the making of necessary connections between the more general courses in educational psychology and theory of teaching and the special work of practice teaching in manual and industrial arts.

While the discussions of the text largely presuppose a knowledge of psychology as a prerequisite, mature students and experienced teachers of the manual or industrial arts who have had no psychology may be expected to pursue the reading of the text successfully by devoting somewhat more time and attention to the reference readings suggested at the close of each chapter. Some experience with manual or industrial arts subject-matter is necessary for an appropriate appreciation of the discussions of the text.

Lest the author be accused of inconsistency in the matter of his choice of philosophical bases for the various discussions, he would state that he has intentionally made use of both the analogies of dualism and of the conception of contiguity and continuity. (Cf. Dewey's "Democracy and Education," especially Chapter XXV.) The accompanying charts should make clear the grounds for justification assumed by the author in the matter of bases. Why there should of necessity be considered any lack of contiguity and continuity in the conception of dualism, and vice versa, philosophy has not been able to prove. (Cf. "Dualism," *The New International Encyclopaedia* for a brief statement.) Given permission to select the experience or interval under consideration, and there is no reason in experience why this permission should not be granted, one may with every propriety consider all opposites

as having continuity and contiguity as charted, and in every situation in which there is continuity and contiguity he may, with equal propriety, take into consideration the opposites. To use Mr. Dewey's own illustration for induction and deduction, it is as if one were to look at a stream of running water; looking in one direction we get one set of implications, looking

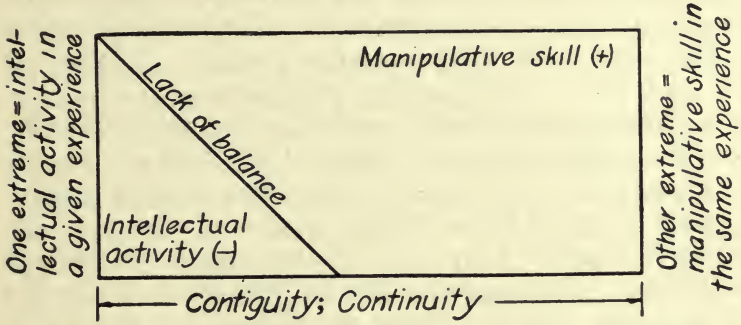


Rectangle of an experience ideally conditioned.

in the other direction we get another opposite set; withal, there is contiguity and continuity. We may speak of the river in terms of opposites, namely, the source and the mouth; we may speak of it in terms of contiguity and continuity.

The balance, or mean, or harmony which the author urges as an ideal toward which to work does not imply there can or must be a perfect balance in all things at all times irrespective of the interval or experience selected. Rather, it is a balance in life of the individual or of the social group only for predetermined intervals or experiences selected for discussion, with each of these intervals or experiences considered as a whole. Such a balance is represented in the accompanying chart by the diagonal of the upper figure. The second charting represents what happens when a selected experience or

interval is not free to develop into such idealism, but is conditioned at the period or interval under consideration thru such factors as natural development, economic or social necessity, or otherwise. While only instincts and intellect, manipulative



Rectangle of an experience conditioned thru nature, economic or social necessity, or otherwise.

skill and intellectual activity are charted here, it is possible to chart in a similar manner other opposites. For example, we might have charted empirical concretes and theoretic abstractions; or, Froebel's (1) spontaneity and (2) instruction in conventional methods of procedure; and, in turn, his (2) instruction in conventional methods of procedure and (3) creative effort. In every case there are implications of extremes but with contiguity and continuity and opportunity for thinking in terms of balance when the experience selected is considered as a whole.

Two methods of procedure are common in the preparation of teachers. One, most common in colleges and universities, stresses theory of teaching, emphasis upon principles or generalized information. The other, most common in normal schools, emphasizes the mechanics of teaching, subject-matter and devices. Each method has its advantages and its disadvantages. Those trained by the first method are slow in attaining effi-

ciency in the art of teaching because they lack knowledge and experience in the mechanics of teaching. They have the theory but not the art. Those trained in the mechanics or details of subject-matter and method get under way quickly, but too often fail to show marked professional growth in the long run because their training has failed to give them the ability to see the teaching process as a science. The plan of this book is one of balance upon the theoretical and the practical. The discussions in the main body of the text are intended to be practically helpful to manual and industrial arts teachers by giving them a basis in science for their teaching practice. The suggestions in the appendices are no less important. Appendix I suggests a type of experience which may well be extended by additional lessons until it shall occupy an amount of time equal to that devoted to the main body of the text. It provides opportunity for attention to what we have chosen to call the mechanics of teaching, attention to details of subject-matter and to devices.

A reasonable requirement of a student engaged in such work might well be that of analysis and classification of teachable content, its selection in terms of functional needs of the group, and its arrangement into the larger groups or blocks for effective instruction. However, it has seemed best to postpone this to a later course, one in Organization and Administration, thus allowing him time to concentrate in this present course upon the problems of methods of teaching and daily lesson plans, with only such organization and administration problems as have to do with the successful presentation of the lesson, such, for example, as sequence of operations in a given problem or job, materials and tools immediately necessary as a part of the work of the given lesson. In the working out of daily lesson plans, the general outline for which has been worked out by a supervisor, to be given to the student-teacher, there will be provided a better preparation for the organization problem

in the large in this later course than otherwise would be. The present course provides all the information needed for the practice teaching that the student-teacher will be called upon to do. Practice teaching must be based upon a supervisor's course outline rather than the student-teacher's, if the work of the pupils is to be well ordered and progressive. Later, the student-teacher may be taught to think of the supervisor's outline in terms of his own planning.

Acknowledgments are due Dr. W. W. Charters, Director of Educational Research, Carnegie School of Technology, for valuable criticism and suggestions as to the general form and content of the text; also, to Miss Ella V. Dobbs, Assistant Professor of Manual Arts, University of Missouri, for permission to use certain photographic illustrations pertaining to elementary handwork. Other acknowledgments will be found in the main text in connection with materials loaned.

I. S. G.

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CHAPTER I

INTRODUCTION

1. Conflicting Aims in Education. In no other line of human endeavor has there been less unanimity and more debate as to aims and practice than in the field of education. Aims have been defined and redefined and practice has passed thru an equally wide range of repeated experiments. For example, one century, or part of a century, has emphasized natural or instinctive tendencies, such as may be found in Rousseau's first teachings; nearly every century at one time or another has tended to stress the intellectual at the expense of the manual; the present sees a wide-spread effort to emphasize automatic connections in the form of trade or vocational education highly specific in character. Not infrequently educators have failed to appreciate that certain very important aims in education conflict one with another and have unwisely sought to condemn every practice which failed to stress the particular educational need which they themselves saw. One educator holds up his hands in horror and exclaims, "What are our schools coming to! We have painting, and sewing, and cooking, and blacksmithing! What next?" Another wants his school so organized that it will rival real life conditions, even to the extent of having a factory system in which boys are to be made so skillful they may turn out a product that will make the system self-supporting, or even profitable. One proclaims education a preparation for living. Another insists that education is teaching children to do better those things children normally like to do.

Educational theory and practice of today is tending more and more toward the recognition of the legitimacy of a variety of aims in education based upon the more common character-

istics of individual and social differences in pupils. For example, schools are being builded and equipped for the especial training of boys and girls who, because of economic or other reasons, do not enter the traditional or general high school. These schools are stressing vocational information and vocational training. This is as it should be. It is well to remember, however, that such vocational training meets the need of a particular group and can no more lay claim to being possessed of *the* aim of education than can a college preparatory school. What is more, the aim of such a training may be such as to conflict with other equally legitimate educational aims so that time so spent is useless in so far as these other needs are concerned.

The homely story of the blind men and the elephant well illustrates the attitude one is likely to assume with reference to the beliefs of others educationally, unless he studies discerningly. The reader will recall that the blind man who happened to grasp the elephant's ear concluded that elephants were like palm leaf fans; the one who touched the elephant's side concluded that an elephant was like the side of a wall; the one who grasped the elephant's tail thought elephants were like rope; while the one who happened to clasp his arms about the elephant's leg was certain elephants were like tree trunks. Each was right in so far as he had informed himself of a part of the body; he was wrong in his hasty or impartial generalization as to the likeness of the whole body. In education we shall do well to refrain from hasty generalizations that the whole body of educational need is like that with which we have informed ourselves and like that alone.

2. Connections in the Nervous System of Man. Before the place and the method of the manual and industrial arts in education can be discussed with intelligence, it will be necessary to review some of our psychology.

For the sake of clearness and convenience we may classify connections in the nervous system of human beings as:

1. Connections between impression or sensation on the one hand and consequent muscular reaction on the other.
2. Connections between impression or sensation and thought or consciousness.
3. Connections between one thought and another thought.
4. Connections between thought and bodily action or reaction.

An example of the first type of connection is found in the crying of the infant because of hunger or pain, or the feeding of the infant in its earliest hours before intelligence has arisen. The touch of the lips of the infant to the mother's breast suggests the appropriate reaction or feeding movement. Such connections are known as instinctive or unlearned. Intelligence or thought or consciousness is absent in these early manifestations.

Connections of the second type are later in their appearance and are the result of many conflicting manifestations of connections number one. A familiar illustration of the development of such connections is that of the very young child at a window before which hangs a brightly colored ball. In the course of its random arm movements, making connections as in number one, it accidentally strikes the ball or its supporting string. At first the noise resulting from the ball's striking the glass goes unnoticed. In the course of a number of such accidental strikings of the ball against the glass thru such random movements of the arms of the child, there begin to form in the mind of the child connections between the idea noise and the bright object. In other words, consciousness is beginning to make its appearance in respect to these particular connections.

In primitive man, and in the earlier periods of the childhood of civilized man, such connections as that just described for

number two, Fig. 1., almost immediately take the form of connections between thought and action, connection number four. The child no sooner connects the impression made by the brightly colored ball with the idea of noise resulting from his moving arms than he tries to produce the noise thru moving

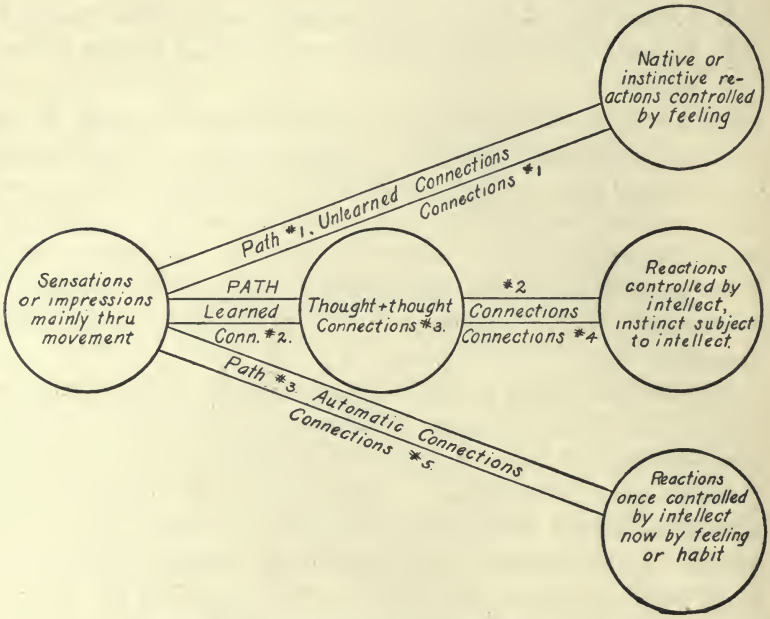


Fig. 1. Connections of Mind and Body.

the arms. Such connections between thought and action may, however, be postponed, taking the form of connections number three, Fig. 1., connections between one thought and another thought—all the while delaying action or reaction.

Connections number five, Fig. 1., differ from connections number one only as to origin. In connections number one, reactions result from unlearned feelings of relationship; in number two they find their origin in intellect.

3. Significance of Connections in the Nervous System of Man in Determining Certain Aims in Education. Aims in education, as has been previously stated, have been variously given, and educational practice correspondingly modified at different periods of educational development. Of the variations which have come, probably none have had greater significance than those which have come thru the changing emphasis placed upon the various connections diagrammed in Fig. 1. Since man is not all mind or all body, but one mind so inseparably connected with a body that life ceases at separation, the diagram is true, of course, only as it represents such emphasis.

An examination of a number of current notions of education will serve to point out the significance of the statement just made. For example, we are wont to say "Knowledge is power." Such a notion of education is bound to result in emphasis upon intellect, connections between thought and thought, upon race experience, upon cramming or storage of facts, upon books, upon long rows of desks and bodily inactivity. Again, we are informed that "It is not knowledge that is power, but applied knowledge; not what is known, but what can be done with what is known." This latter idea places emphasis upon connections number three and number four, Fig. 1. Another educational philosopher tells us that "Education is what one has left after he has forgotten all he ever learned." At first thought we are inclined to ridicule such a notion of education. However, there is truth in the statement. It is merely the placing of extreme emphasis upon automatic connections, path number three, connection number five, Fig. 1. The condition one finds himself in when called upon to explain some method of procedure or position of the hands in some operation which has been performed many times, is an excellent illustration of what this educator is trying to designate as education. One can perform the operation, or he can readily place his hands in position for the required

operation, but he finds great difficulty in telling another how it is to be done. Intellect has ceased to function; habit or feeling has taken its place.

It is essential for a proper understanding of the discussions which follow that the student have a clear notion of the distinction which is made between learning thru feeling and learning thru intellect. The student will readily understand what is meant by the term intellect. The term feeling, however, is used in a rather special or uncommon sense. The following extract from a current newspaper article will illustrate the peculiar meaning attached to the word feeling in the discussions which follow: "French instructors," it says, in explaining the method of training aviators, "express no preferences, except for the double control in teaching. It permits the instructor to take his pupils up behind him, and as the entire control is double (like the coupled handlebars of a tandem "bike") the teacher guides the aeroplane, but the pupil, having the same controls in his hands, feels every movement made by his instructor. Little by little he acquires the habit and feels that it is he who is piloting, and the instructor, as he feels the pupil getting the right movement, slackens and lets the pupil do more and more, until, at the end, the original positions are reversed—it is the pupil who pilots the aeroplane and the instructor who feels him thru the double controls as he does it." This type of learning process is designated by Dr. Charles H. Judd*, as learning by direct interpretation—direct in that it does not involve consciousness or intelligence, or at least tends to eliminate these as quickly as possible in favor of learning thru feeling.

The significance of the connections of the nervous system in determining certain educational needs is clearly set forth in Henri Bergson's philosophy of the function and origin of instinct and intelligence when this philosophy has been analyzed

*"Genetic Psychology for Teachers," page 59, et. seq. Appleton, 1903.

in terms of the connections enumerated above and diagrammed in Fig. 1. His discussion serves well to point out the limitations of a type of education which would stress intellect to the neglect of feeling and vice versa. "Instinct and intelligence" he says in his Creative Evolution, page 143, "therefore represent two divergent solutions equally fitting, of one and the same problem," namely, the problem of meeting one's environment. "We know," he continues, page 172, in illustration of the strength of instinct or feeling such as is represented by path one, Fig. 1., "that the different species of the hymenoptera that have this paralyzing instinct lay their eggs in spiders, beetles or caterpillars, which, having first been subjected by the wasp to a skillful surgical operation, will go on living motionless a certain number of days, and thus provide the larvae with fresh meat. In the sting which they give the nerve centers of their victim, in order to destroy its power of moving about without killing it, these different species of hymenoptera take into account, so to speak, the different species of prey they respectively attack. The Scolia, which attacks the larva of the rose beetle, stings it in one point only, but in this point the motor ganglia are concentrated and those alone; the stinging of other ganglia might cause death and putrefaction, which must be avoided. The yellow winged Sphex, which has chosen the cricket for its victim, knows that the cricket has three nerve centers which serve its three pairs of legs—or at least it acts as if it knew this. It stings the insect first under the neck, then behind the prothorax, and then where the thorax joins the abdomen. The Ammophila Hirsuta gives nine successive strokes of its sting upon nine nerve centers of its caterpillar, and then seizes the head and squeezes it in its mandibles, enough to cause paralysis without death. The general theme is "the necessity of paralyzing without killing." * * * "It is in vain that we try to express it in terms of any idea: It must have been originally *felt* rather

than *thought.*" It is an unlearned feeling of relationships, as it were, having nothing to do with intelligence or thought. Its very strength lies in the fact that appropriate action follows this feeling of relationships without hesitation and consequent representation resulting in consciousness or intelligence.

The preceding paragraph should make plain the fact that what has, for want of a better name, been called *feeling* plays no small part in the control of appropriate responses to stimuli, and as such must be given appropriate consideration in any scheme of education. The responses mentioned have to do with reactions thru feeling not controlled by intellect; they are of path one, Fig. 1. There are also responses thru feeling which responses at one time were controlled thru intelligence or consciousness or thought. These latter responses are of path number two, Fig. 1., in their beginnings but are translated to path number three thru frequency.

Just what relationship intelligence has with feeling in this transformation may be learned from the following quotation in Bergson's *Creative Evolution,* page 145. "The consciousness of a living being may be defined as an arithmetical difference between potential and real activity. It measures the interval between representation and action. It may be inferred from this that intelligence is likely to point toward consciousness and instinct toward unconsciousness. For where the implement to be used is organized by nature, the material furnished by nature, and the result to be obtained willed by nature, there is little left to choice; the consciousness inherent in the representation is therefore counterbalanced, whenever it tends to disengage itself, by the performance of the act, identical with the representation, which forms the counterpart. Where consciousness appears, it does not so much light up instinct itself as the thwartings to which instinct is subject; it is the deficit of instinct, the distance between the act and the idea, that becomes consciousness so that consciousness,

here, is only an accident. Essentially, consciousness only emphasizes the starting point of instinct, the point at which the whole series of automatic movement is released. Deficit, on the contrary, is the normal state of intelligence. Laboring under difficulties is the very essence."

It should not be hastily concluded from the strength of the plea just made for attention to feeling or direct interpretation in setting situations for educational experiences that there is no place or only a small place for attention to intellect. Whatever man might have gained by a biological evolution along the line of dependence upon instinct alone to the exclusion of intelligence, the fact remains that he has chosen to live more largely thru intellectual control than have hymenoptera and other insect and animal forms, and that consciousness must ever play a large part in the education of his young. Adjustment to environment may be accomplished thru instinct, path number one, Fig. 1.; this same end may be accomplished in the case of man thru the taking of path number two and thru repetition reducing mental effort until the reaction takes the form of path number three. For example, we may take the case of a physician who performs a skillful surgical operation: originally, mental effort was strong; by repeated operations this is reduced until reaction places almost complete dependence upon feeling or sense-impression. The reaction becomes a matter of habit. Habit accomplishes for the individual what instinct accomplishes for the species: an effective reaction to stimuli without the intervention of thought, or at least it tends to accomplish this.

Professor James says, "An uneducated person is one who is nonplussed by all but the most habitual situations." This negative statement of what education is should remind us that education has a second task. Habit formation in the realm of muscle is but one factor, the development of intelligence, of ability to do selective or original thinking, is of no less

importance. What is more, it must be recognized that these two ends or aims, conflicting as they do, can find no setting in the educational scheme wherein one may be emphasized without a consequent sacrifice upon the part of the other. We may choose to emphasize habit in the realm of muscle; we may choose to emphasize intellect; we may choose to balance one against the other with a consequent lack of effectiveness in each as compared with what might have been secured thru lack of balance. James is stating in another way the fact that the development of intelligence is an essential part of education.

4. Connections a Basis for Method. In general, a consideration of the connections in the nervous system of man justifies the following statements: (1) The cycle of development of an individual consists of a period characterized by instinctive or random movement; (2) out of these random movements develop consciousness or intelligence; (3) intelligence marks a hiatus or hold-up between instinctive promptings and consequent motor reaction and as such will have no value until it takes discharge in the form of action. (4) Only as man, or the race, maintains a balance between intellect and feeling is race progress best effected. Individuals may become specialists: some may become mind workers, others hand workers; that is, some may emphasize intellect, others habits controlled by feeling, but race progress demands the maintenance of a balance. (5) Individual welfare demands that this balance be maintained, certainly thru the elementary period of education or until the natural aptitudes of youth may have opportunity to manifest themselves.

An education which emphasizes intellectual activity for any great length of time and neglects opportunity for appropriate motor response thru application, is uneconomical, to say the least, for nothing is assuredly assimilated until it issues in action of one kind or another. If the application is

far removed in time, memory will fail. On the other hand, an education which is so direct in its connections between impression and reaction that it allows little time for thought or reflection, is ill advised in that it neglects to take into account the fact that man meets new situations more effectively thru the workings of intellect than of instinct, or at least as effectively, and intelligence does not function or have a part in instinctive and automatic connections. The saying "It is hard to teach an old dog new tricks" is but another way of saying that unless the memory processes are kept open progress is not possible. Memory is of mind, of intellect, not of feeling.

5. Social, Economic, and Other Factors Influence Aims and Practices. Psychological considerations, such as those just mentioned, are not the only ones to be considered in determining educational aims and practices, of course. There are social and economic, ethical and other considerations equally as important. What is more, not a few of these latter considerations are conflicting in their aims with those of psychology. We know, for example, that early fixing of highly specialized habits in industrial pursuits does not produce a very high type of education in many respects. We also know that very few pupils who are destined to perform such industrial work can remain or do remain in schools thru that age which best fits the development of intelligence in connection with their industrial work, Fig. 2. It becomes a question, then, of turning out a type somewhat better fitted for earning his bread and butter in industrial work requiring relatively little initiative or of letting him go without even doing this much for him. Psychology and ethics will tell us what ought to be our educational practice; social and economic needs will tell us what must be, until that time when our economic conditions are made to square with our ethics.

If the discussions which follow are found advocating higher types of educational need in that they set situations which tend

to develop initiative, it must not be concluded that there is lack of sympathy for attention to the needs of those who cannot pursue such courses because of economic need or otherwise. On the other hand, when the discussions lead to

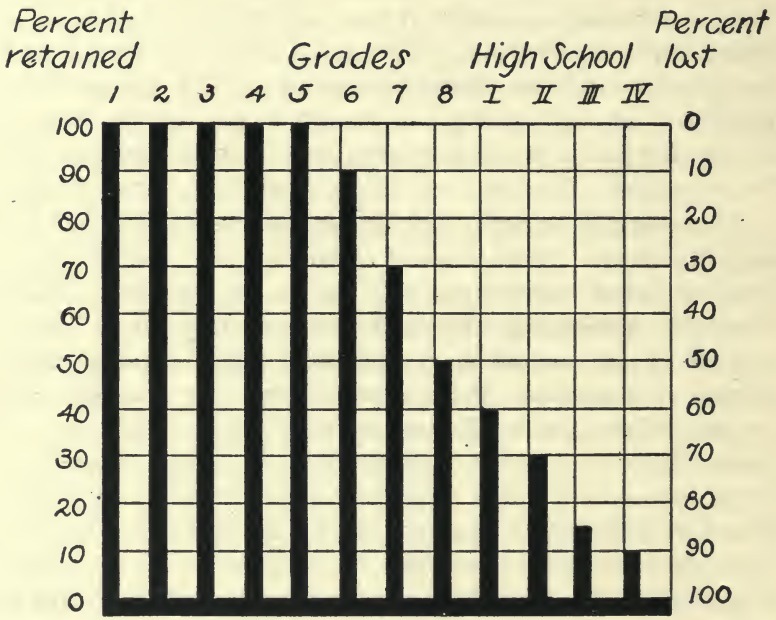


Fig. 2. Adapted from Dr. Ayer's "Laggards in Our Schools," p. 71.

a justification of such a type of education as takes the immature pupil and trains him so specifically for an industrial task requiring so little intelligence that he can never hope to rise much higher than a machine tender, it must not be inferred that this is other than doing the best for the pupil that unfavorable economic and social conditions permit.

For example, boys are not sufficiently developed physically and mentally, to justify the giving of vocational work of a serious nature much before sixteen years. This fact is evi-

denced by the reluctance of employers to take on apprentices much younger than this. Of course, if they have a type of work where it is possible to exploit the boy's labor they may take him on, but if it is a matter of teaching him a trade, for example, they do not want the boy of younger age. Psychologically, then, the high school age is the place for industrial training of a serious nature. Over against this fact we must place the fact that few boys who go into industry as journeymen remain thru the grammar schools. Raising the limit of the school age for compulsory school attendance with part-time work will aid; it does not solve the problem of urgent economic need in the home.

Rightly considered, then, the problem becomes one of providing courses that permit pupils to accomplish all they are able to accomplish in the time available. These in turn are limited by problems which arise in matters of school administration, such as lack of funds, lack of sufficient demand for certain kinds of work, etc., to warrant the formation of classes and the employment of teachers, lack of suitable teachers, and lack of adequate salary schedules calculated to encourage strong men to expend the necessary time and money required to properly equip themselves for this kind of work.

6. Summary. Aims in education conflict. Since many of these aims are equally important for purposes of individual and social welfare, it follows that educational practices must vary.

An examination of the connections in the nervous system of man teaches us that society and the race depend for successful maintenance and progress upon the development both of efficient forms of thinking and of action. This balance may be maintained for society and the race thru the utilization of rather highly specialized forms of each type. Elementary education, however, will do well to maintain a balance between thought and action for purposes of giving to the

adolescent a proper basis in action for later specialization in thought, and vice versa, and for determining aptitudes.

Economic, social, and other needs of society and of the individual will affect educational aims and practices, frequently running counter to those set by psychology and ethics. A consideration of immediate economic and social needs may point to the wisdom of offering opportunity for early entrance into industry, even at the expense of opportunity for the development of industrial and social intelligence. It also points to the need for continuation courses to supplement such lack.

Reference Reading:

Thorndike: *Principles of Teaching,* Chapter XIII.
James: *Talks to Teachers,* Chapters III—V.
Charters: *Methods of Teaching,* Chapter I.

Class Discussion:

1. Discuss the need of motor responses.
2. Differentiate the varieties of motor responses.
3. State the advantages and limitations of verbal responses.
4. Discuss advantages and limitations of expression thru the activities of the arts and industries.
5. Define education so as to indicate the part to be played by the manual arts, if you can.
6. James says, "An uneducated person is one who is nonplussed by all but the most habitual situations." Is there no place, then, for the training of boys and girls as industrial automatons? Discuss.
7. Supt. Dyer says, "Education is what is left after all that has been learned is forgotten." Discuss.
8. "No reception without reaction, no impression without correlative expression." "Motor consequences are what clinch it" (An impression). Can you find an argument in these statements for manual arts as a means of teaching other subjects as history, geography, etc?

CHAPTER II

CLASSIFICATION AND DIFFERENTIATION OF THE MANUAL ARTS

1. Classification and Differentiation of the Manual Arts. Observation of common practices in those activities designated manual arts or manual training will show wide differences in the practices, and investigation will make evident equally wide variation as to basis for justification. Not infrequently like practices will be found justified upon divergent grounds. For the sake of convenience, these practices and their grounds for justification may be differentiated one from another as they tend to stress one or another of the following functions: (1) A means of expressing ideas—"No reception without reaction, no impression without correlative expression." "Motor consequences are what clinch." (2) A means of developing certain attitudes of mind and habits of body and mind in some one or more lines of industrial activity, not as ends in themselves in connection with the particular trade dealt with so much as attitudes and habits chiefly useful as a means of interpreting other related experiences. Upon this ground every boy of an upper grammar grade may be required to take woodwork and mechanical drawing even tho it is known that very few of them will become workers in wood in after life. Such industrial experience, as differentiated from commercial, agricultural, academic, etc., will make for an appreciation of things industrial. (3) A means of developing a knowledge of technical processes and habits of mind and body in a given industrial activity as ends immediately helpful to the individual because he will make use of them in the pursuit of this activity in after life. The first of these we may designate as expressional manual arts; the second, technical manual arts for general educational purposes; the third, technical manual arts for vocational ends. The function of the first is

free expression; of the second, appreciation of industrial activities; of the third, efficiency. The first is psychological in its signifiance; the second is cultural and disciplinary; the third is vocational.

It must be recognized that such classifications are for convenience in discussion and that no clear-cut distinctions actually exist between such groups in reality. The differences are matters of emphasis or of tendency rather than of kind. For example, those values which come thru opportunity for expression of ideas are to be found in manual arts justified on the ground of discipline, but in minor degree. Close attention to acquiring efficiency in some one trade has cultural value in that it develops appreciation and broadens the horizon to that extent, minor tho it may be.

The difficulties involved when one undertakes to classify sharply are seen in the attempt to place a type of work which is beginning to find favor with administrators of high schools wherein large numbers of boys must be provided with opportunity for manipulative activity. These boys are not destined to make their living thru participation in skilled crafts, at least not as workmen. Administrators with a functional notion of education object to the traditional type of manual arts with its justification thru culture, discipline, appreciation, and are asking for a type wherein the manipulative processes and the accompanying information will serve as a means the better to prepare the prospective householder to perform the many home tasks of an industrial nature requiring minor technical knowledge and skill. Such work will not class fully as vocational as the term has been defined; it is too strongly functional to class as a discipline and an appreciation in its implications. It is, as it were, on the dividing line between the two. Until this type becomes more common than it now is we may simply class it as technical manual arts for general educational purposes.

Manual arts and vocational education for industrial activities have been confused as to place and function because they differ not as to kind but as to emphasis upon certain factors. The terms vocational, prevocational, industrial or trade, and pre-industrial or pre-trade are terms which have often been applied to work differing in no essential characteristics from

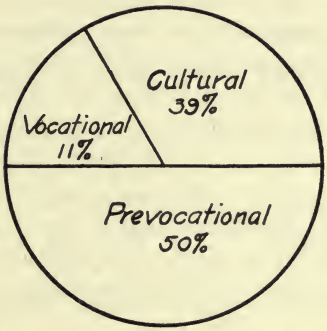


Fig. 3. Report on Dominant Aims of Manual Arts Instruction in 156 cities in the U. S. A. From Bulletin No. 32, 1916, Bureau of Education, Washington, D. C.

what has long been known as manual training. Attempts have been made to differentiate vocational industrial education from manual arts by assigning to manual arts a method of procedure known as the craftsman's while vocational industrial education would be distinguished by its use of the factory system of production in quantity.

This differentiation, while convenient, is confusing, for experience has shown that both manual arts and vocational industrial arts may accomplish their ends thru either method of procedure; in fact, both methods are needed in each to give a complete experience. Probably the notion that manual arts is primarily a training for appreciation of things industrial, good for all pupils without regard to their probable future work in life—a culture, a discipline—and that voca-

tional education is primarily a training for efficiency in preparation for entrance into some specific life activity which the pupil expects to follow, is the most helpful view for purposes of differentiation.

Grade	Purpose	Type of Work
I-VI	General Educational	a. Expressional—largely b. Technical—various simple media
VII-IX	General Educational	a. Drafting b. Woodwork c. Metalwork d. Other media Largely technical, but elemental. May be based on home repair needs or on industrial "types" or both.
X-XI	Special Vocational	Pupil chooses one industrial, as carpentry, etc. Organized for instruction. Production secondary.
XII	Special Vocational	Pupil continues subject of XI. Organized for production. Instruction secondary. Part-time work, if possible.

Fig. 4. A Form of Organization of Manual Arts for general educational and vocational ends.

The terms pre-vocational or pre-trade, then, would apply to a type of training in the elements of a number of activities or trades so that the pupil might have a basis for choice. Here the distinguishing characteristic is the fact that the pupil realizes that he is headed for some one or another of these

life activities or trades and must make his choice as soon as possible. Fig. 3., represents graphically dominant aims for manual arts in 156 cities of the United States as expressed by those in authority in these cities.* Observation in a number of these cities reporting different aims shows work differing in no essential one from the other. It is highly probable that these expressions of dominant aim as trade, or even prevocational, as shown on the chart, represent hopes and expectations based upon hopes rather than justifications based upon investigation of what use pupils make of these experiences after leaving school. Only as the majority of pupils make use of their school training in specific trades in their future life's work are we justified in calling such school work trade training. Only as such school activities provide a definite basis for choice of future life work for a majority of pupils are we justified in calling the work pre-vocational.

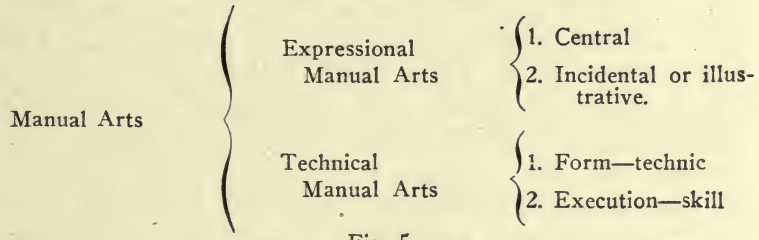


Fig. 5.

A careful investigation of what use public school graduates make of such school training would probably show a larger number of justifications of such work on the ground of culture and discipline. The extremes to which the dogma of discipline led educators and the more recent exposure of many fallacies justified under this name probably account for the hesitation manifest in owning to such an aim as dominant. Whatever the theory or hope, the fact remains that, whatever values lie in any practice, these are not destroyed

*Bulletin No. 32, U. S. Bureau of Education, Washington, 1916.

by wrong classification as to function and that values not present cannot be made so thru mere classification.

The purpose of the classifications made in this chapter is to point out significant factors making for certain directions or tendencies rather than to mark off sharp lines of cleavage.

Fig. 4 suggests a form of organization equally useful to the student taking the work for appreciation and to the student taking it for possible usefulness as a means of preparation for livelihood. It is recognized, of course, that most boys headed for industry cannot complete such a course because of the element of time and money. Such pupils will have to have less related work and more industrial work which will mean advancement in the shop experience according to necessity rather than according to desirability.

Whatever these special adjustments may be, the fact should not be lost sight of that industries which require skilled workers, which provide opportunities for advancement above mere machine tending, have little use for boys under 18 years, the age at which they would complete a four year high school course as outlined. The real problem for solution in the training of skilled workers is that of providing a way whereby boys whose parents are poor may remain in school, or may have training on the job, or in both school and on the job. This and other problems of organization and administration together with justification of the form of organization of teaching materials in Fig. 4 will be found in the author's *Organization and Administration of Manual and Industrial Arts,* a companion text in preparation.

2. Technical Manual Arts. For purposes of easy recall the main divisions and subdivisions of the manual arts may be visualized as in Fig. 5.

Form may be loosely defined as that body of information and understanding of the best ways of doing any given thing, which information has been handed down from generation

to generation—or, more accurately stated, it is the science underlying the art or practice which serves to increase the effectiveness of physical accomplishment of any given task. For example, thru countless generations of working wood, men have evolved a method or order of procedure in what is called squaring-up stock, which order is used by workers in wood in every civilized country. This order is not arbitrary or haphazard, altho many an otherwise intelligent worker in wood cannot state the underlying reasons for this order, but is based upon the fact that this particular order reduces the chances for error to the lowest possible number.

This reason underlies practically every other operation in working wood. A worker in wood, then, is said to possess good form and technic in respect to squaring-up stock when he knows and makes use of this particular order. Form applies to anything one may be able to do to better execution. The baseball player who places his hands upon the bat in a certain generally prescribed way and assumes a certain position at the plate is said to have good form. A convenient expression for the idea of form as it applies to technical manual arts is found in the phrase, "conventional order of procedure." Technic is form in use.

Execution has to do with muscular control in the accomplishment of an act. Skill refers to the effectiveness with which the carrying out of an act meets the demands for such action. A worker in wood is said to be skillful when, to his knowledge of the conventional order of procedure in squaring-up the stock, he has added an ability to actually square-up the stock with accuracy and ease.

Evidences of good form are best seen when utilized in execution. For this reason there sometimes arises a question in the mind of the beginner as to the part played by each. This difference may be seen readily in the case of any individual who is called upon to form new habits. One may understand

fully, for example, all that enters into the riding of a bicycle or the driving of an automobile, or the flying of an aeroplane in so far as proper form is concerned; skill in execution, however, is a matter of improvement in muscular adjustment coming only thru trial and error. Two groups of boys of supposedly equal capacity and experience are asked to square-up a given number of pieces of stock. The governing conditions are made such that the only difference is, that one group is informed and has mastered mentally the conventional order of procedure, the correct form in squaring-up stock such as has been handed down from generation to generation. The other group is not so informed. The value of teaching proper form is seen when these boys have been set to work, also the limitations. It will be found that one group has secured the requisite results more quickly than the other. It will be found that so far as the actual acquiring of muscular adjustment thru trial and error is concerned the informed group has had little advantage over the uninformed.

In case of each group trial and error was the necessary prerequisite for improvement. The chief source of advantage of the informed group over the uninformed lay in the fact that the order of procedure they were taught and encouraged to follow reduced the chances for error to a minimum. The athletic coach is of service mainly because he knows and teaches and encourages his students to make use of good form. The shop instructor is of service for the same reason. Execution or the acquiring of skill is a matter in which the pupil must work out his own salvation, guided, of course, by the knowledge of proper form or technic. Form is a matter of intelligence, of consciousness, of connections between thought and thought. A consideration of matters of form will therefore tend to delay or hold off execution. Skill, on the other hand, becomes effective just to the extent movement can be freed from conscious control in execution.

Technical manual arts are distinguished from other forms of manual arts chiefly thru the emphasis placed upon the teaching of proper form and the development of good technic in conventional methods of procedure as developed thru race experience, and upon skill in execution. Teachers of technical

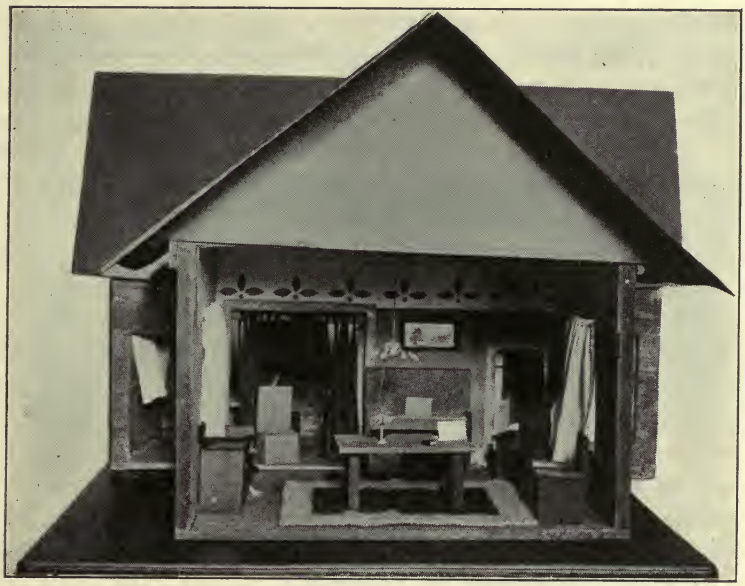


Fig. 6. Doll House Problem.

manual arts will do well to remember that such emphasis represents but one aspect of educational need to be met thru what is called the manual arts. They will do well to remember that psychologically there is little value in emphasizing technic and skill until a feeling of real need for these upon the part of the pupils has been developed thru preliminary spontaneous activities of a similar character which tend to result unsatisfactorily after awhile because of their not being

based upon a knowledge of proper form and a fair degree of skill in execution. They should remember that this acquiring of knowledge of conventional methods of procedure, or form, and the development of skill in execution are not ends in themselves, where the highest good of the individual and society is sought. They are, rather, means to an end, namely, the development of a more efficient expression than that to be found in the early stages of spontaneous activity—more efficient because of being based upon knowledge of proper method of procedure and a degree of skill sufficient to serve as a foundation for further advancement. Emphasis upon technic and skill is the middle stage of Froebel's (1) spontaneity, (2) instruction, (3) creative effort.

3. Expressional Manual Arts. The term expressional manual arts is usually taken to mean that type of constructive activity which is free from the necessity of making use of conventional methods of procedure in the manipulation of materials or of developing a degree of skill sufficient to have the product class as other than amateurish and crude from the standpoint of technic and skill. Manual arts characterized by such freedom of expression may be subdivided into central on the one hand and incidental or illustrative on the other according as the ideas develop or grow out of the activity or the activity out of the idea.

If, for example, children of the primary grades are encouraged to engage in the construction or furnishing of a doll house, Fig. 6, and out of this activity the teacher should cause to be developed lessons in language or number, this would class as central expressional manual arts. If, on the other hand, certain ideas are supposed to be in the minds of the children and the teacher seeks to fix these thru manual expression, she may do so thru what is known as incidental or illustrative manual arts, Fig. 7. Such expression not only assists in fixing the information or ideas but serves as a

means of clarifying such ideas, or at least of showing to the pupil and teacher a need for further consideration of the information supposed to have been mastered.

There are those who refuse to consider such expressional handwork as a part of the manual arts. To refuse to do so is to neglect an opportunity to make use of, and to assist in orienting, a kind of work which is of most vital importance to the manual arts movement as a whole. Much confusion has arisen because of a failure to distinguish clearly the aims and characteristics of expressional and technical manual arts.

Fig. 7. Sand Table Problem.

Let it be said in the beginning that those advocates of expressional manual arts who strive to convince us that expressional manual arts is calculated to produce skill and impart good technic as a sort of by-product of free expression in various media without in any way detracting from the value of the expression or illustration, are confusing the issue. Since the purpose of expressional and illustrative manual arts is primarily mental, intellectual, emphasis upon the idea to be expressed, emphasis upon technic and skill or automatic connections must necessarily tend to interfere with the aim of this kind of work.

For example, if we choose to have a class construct apparatus to illustrate the earth's movement about the sun, any

rough block of wood may serve as a base and any rough objects of a spherical form serve as sun and earth, a piece of wire appropriately bent may be utilized to hold the bodies in proper position relative to one another to produce the motion required. The thing may be hurriedly made and be very crude in matters of skill in execution and in conventional methods of working wood; if it but serves to illustrate the thing desired it has served its purpose. To take time to teach the conventional method of procedure of squaring-up stock for the base and the conventional method for modeling a sphere would be to interfere with the free expression of the idea, which is the essential thing here. Or, it may be the making of a hurried blackboard sketch by the teacher in an attempt to convey better some thought or idea. To take time to make an elaborate drawing, excellent in technic and skillful in execution, would mean probably so long a delay in the conveying of the idea, with a probable centering of attention on technic and execution, that the essential thing, the idea to be conveyed, would be lost sight of. Of course, if the blackboard drawing is one to be used for purposes of teaching good technic, no pains should be spared to make of it the best of its kind.

In the case of the illustrative drawing it is well to make use of such technic and skill as can be without causing a serious sacrifice upon the thought side. In the case of the hurried illustrative drawing it is the part of wisdom to erase the same once it has served its purpose, lest some pupil later confuse its aim with the aim of a technical drawing to the detriment of pupil ideals as to a technical drawing and his respect for his instructor's ability as a draughtsman.

With the limited time usually devoted to expressional manual arts, central and illustrative, in the schools of today, and the fact that our grade teachers of the regular school, by whom this work is to be given, are in the main idea minded and

idea trained, there is in general small need to emphasize dangers incident to expressional manual arts work. Such dangers do exist, however, and it may be well to mention the more common that the enthusiast for this type of work may not bring his subject into disrepute thru extreme interest.

First, as has been stated, there is the danger of failing to recognize that the aims and means of expressional and technical manual arts conflict and that it is hardly possible to accomplish technical ends in expressional work without doing injustice to freedom of expression or else failing of accomplishment of standards of achievement inherent in results that shall class as technical.

Second, where the teacher of expressional manual arts recognizes the fact that freedom of expression is the primary reason for the existence of such work, there is sometimes a failure to appreciate the fact that there is also a need and a place for that other type of experience known as technical manual arts with its restrictions upon freedom of expression. Teachers of technical manual arts are equally prone to forget that their type of work is not the only type which may legitimately find a place in the field of educational endeavor.

Third, there is the danger of allowing a child to express himself thru crude methods of expression when the problem is one which calls for what we have designated a more efficient expression—an expression based upon a knowledge of form or technic and a skill already possessed by the pupil in such degree as not seriously to interfere with freedom of expression. For example, in the furnishing of a doll house in the primary grade, the children may have need for a paper mat of simple weave and color design. It is quite likely they will have been taught the technic of such weaving and color selection in their technical handwork. The teacher will do well in the furnishing of the house to insist that the children

make use of this technic and skill in the making of the mat for the house.

Fourth, teachers of illustrative handwork should remember that a thing which is perfectly clear in the mind of a child needs no illustration thru construction—words or speech will save time and time so saved may be utilized for other purposes. If it is participation in activity that is wanted, and no problems really needing illustration or clarification are available, the time may well be spent upon technical handwork.

Fifth, teachers of expressional manual arts should remember that central expressional manual arts, while used primarily as an activity out of which related academic work such as language and number may be developed, is also a preliminary to technical manual arts. It is Froebel's (1) spontaneity, which leads to and prepares the way for (2) instruction, thru creating a feeling of need.

4. Relation of Expressional to Technical Manual Arts. Expressional and technical manual arts have been differentiated with respect to stress upon, or absence of, intellectual values. It is said that expressional manual arts is strongly intellectual while technical manual arts is not. This statement needs explanation. There are two kinds of intellectual activity: (1) a type wherein the individual is responsible for initiating and working out means to an end; (2) a type wherein the individual thinks the thoughts of another or others for the accomplishment of a given end. If reference is had to this first type, then expressional manual arts is superior.

However, sight should not be lost of the fact that exercise of initiative in the planning of means to an end is very inefficient in accomplishing results until it is based upon instruction in conventional methods of doing related work and a fair degree of skill. If this latter type of thinking is not so high as the first, it is much more efficient in accomplishing

predetermined ends. If one has the advantage upon the side of a higher type of intellectual activity, the other has the advantage upon the side of knowledge of race experience and skill.

It must be admitted, of course, that a conflict does exist between free expression and instruction in conventional methods of procedure—one cannot tell a boy how to make a mortise-and-tenon joint and at the same time have him discover how it is to be made. Likewise, the development of great skill cannot be expected at the time a student is mentally active in an effort to make the first application of instruction.

Expressional and technical manual arts have been differentiated by the statement that expressional manual arts has no subject-matter of its own but is merely a means of teaching other subject-matter, while technical manual arts is an end in itself and is possessed of subject-matter. Strangely enough, these attributes are, by others, reversed—expressional manual arts is said to have subject-matter, while technical manual arts is said not to have subject-matter but to be of value as a means or method.

These conflicts are accounted for by the fact that both expressional and technical manual arts have dual significance. When it is said that expressional manual arts has subject-matter, reference is had to that type of expressional manual arts which has been called central. When expressional manual arts is said to be a means, reference is had to illustrative manual arts. Technical manual arts utilized for general educational purposes, as a discipline, is valuable chiefly as a method. A boy taking woodwork who never becomes a worker in wood is benefited not so much because he has mastered the subject-matter of woodwork but because he has acquired certain attitudes, habits of mind and body which assist him in interpreting related experiences in later

life. Technical manual arts for the boy who expects to follow that particular line of work in after life, technical manual arts for vocational ends, is valuable for subject-matter as well as method; skill and knowledge of conventional methods of procedure here are ends in themselves.

5. Harmonization of Conflicting Aims. In general, conflicts between expressional and technical forms are best harmonized in terms of Froebel's (1) spontaneity, (2) instruction, (3) creative effort. The growth of consciousness, we are told, is like the clearing of a fog—at first we see darkly, then, one by one we are able to distinguish or differentiate objects and to classify. Expressional manual arts is largely a means of working out this clarifying process in the mind of the child, not so far removed from that "big, blooming, buzzing confusion," that one-ness of the individual from which he works out his differentiations thru movement, random at first and later controlled. In performing this function manual arts is concerned with the expression of ideas rather than with processes.

Of no less importance, altho incidental, is the fact that such spontaneous or free activity becomes the means of developing a feeling of real need for knowledge of better ways of accomplishing results in the manipulation of materials. With the accomplishment of this, the pupil is ready for the second of Froebel's steps. Better ways of accomplishing results are to be secured thru instruction and practice in the applications of conventional methods of procedure developed thru race experience.

This latter constitutes the distinguishing feature of technical manual arts. Once the pupil has mastered technic and a fair degree of skill in the particular convention under consideration he should be given opportunity to enter upon step three, creative effort based upon such instruction. This last step represents the highest attainment in the educational pro-

cess. It should be the culmination of all manual arts experience. It is the most efficient type of expression; more efficient than spontaneous expression because of being based upon knowledge of proper form and a degree of skill sufficient to serve as a foundation for future advancement; more efficient than the second stage, instruction, because it is free, the ideas originating in the mind of the worker and not being imposed by another or others. Tho spontaneity, instruction, and creative effort are mutually exclusive at any one time, yet by close alternation and development the advantages of each may be realized.

It will serve to clarify the confusion which sometimes exists as to the relation of expressional to technical manual arts if a definite time for technical manual arts is set aside on the school program. At such times technic and skill may be emphasized and both teacher and pupil brought to see that here the aim is the acquiring of a knowledge of conventional method and of skill—it may be no more than the simple paper weaving of the first grade. Expressional handwork may be given during the time of the class, the subject matter of which it is intended to develop or to clarify and illustrate—at any rate, the difference in aims should be evident to both teacher and pupils and standards set accordingly.

Expressional handwork will find its largest usefulness in the earlier grades, gradually diminishing in importance as the children grow older and better able to get ideas thru words. Technical manual arts will find itself with smaller time needs in the beginning grades, for little children see little need for technic and skill, with growing importance as age increases.

While it is highly desirable that aims in expressional and technical manual arts be clearly defined and differentiated in the minds of both pupil and teacher, it should be recognized that this is merely a matter of convenience and of emphasis

in conflicting aims. It is desirable, for example, that booklets, clay animals, paper mats, woven rugs, etc., made in technical manual arts periods, where proper technic and form and skill in execution were emphasized, be utilized in the working out of expressional manual arts problems, such as the use of the rugs in the central expressional manual arts problem of the doll house, or of the clay animals in sandtable problems in illustrating lessons in geography, history, or literature, etc.

Again, in any illustrative or other expressional lesson, pupils should be encouraged to make use of such technic and skill as they have already secured in the technical manual arts, in so far as this can be done without seriously interfering with the free expression of the lesson. Out of such correlations should develop eventually a type of expression which we have called a more efficient expression—more efficient because of its being based upon technic and skill in related matters. For example, out of a boy's seventh or eighth grade technical shopwork in wood, wherein he has been required to emphasize technic and skill, ought to come an ability to express his personal desires for the execution of pieces of woodwork, such as furniture, much more efficiently than if he had never had such technical experiences. Then, too, if such a boy has been given at least a few opportunities for the carrying out of such original pieces of work as his mastery of technic and skill make possible, he will be a more valuable type of citizen than one who has never been encouraged to think or act other than as he is told.

6. **Summary.** For the sake of convenience the manual arts may be classified and differentiated according as they stress one or another of the following functions: (1) A means of expressing ideas without restraint due to considerations of conventional methods of procedure and skill. (2) A means of developing certain attitudes of mind and habits of

both mind and body in some one or more industrial lines, which attitudes and habits are possessed of value chiefly because they enable the individual to properly evaluate and appreciate things industrial in his future life contacts. (3) A means of developing technic and skill in some one or more industrial lines as ends in themselves, useful because the individual expects to follow that line or those lines after leaving school.

When emphasis is placed as in number one above, this is designated expressional manual art; when stress is placed as in number two, it is designated as technical manual arts for general educational purposes; when the stress is as in number three, we have what is called technical manual arts for vocational ends.

Technical manual arts may be divided into considerations of form, technic, execution, and skill in execution. Expressional manual arts may be considered under subdivisions known as central and incidental or illustrative.

Technical and expressional manual arts are differentiated one from the other mainly thru the variation in stress or lack of stress upon form, technic and skill in execution.

In spite of conflict of aims, both expressional and technical manual arts can be justified and harmonized as a part of the educational scheme; this is best done thru Froebel's (1) spontaneity, (2) instruction, (3) creative effort. Expressional manual arts is most concerned with number one, spontaneity; technical manual arts with number two, instruction; both are preparatory to number three, creative effort.

Reference Reading:

Thorndike: *Principles of Teaching,* Chapter XIV, review Chapter XIII.
Dobbs: *Primary Handwork,* pp. 1-5, 24-26, 115-121.
Dobbs: *Illustrative Handwork,* Chapter I.
Judd: *Psychology of High School Subjects,* Chapters XI, XII.
Griffith: *Correlated Courses in Woodwork and Mechanical Drawing,* pp. 1-2, 7-11.

Class Discussion:

1. What is meant by the term expression?
2. What is form; technic; execution; skill?
3. Define form and skill with reference to consciousness.
4. To what extent is expressional manual arts concerned with skill? Technical manual arts?
5. Enumerate the general principles, as laid down by Thorndike, for teaching manual arts.
6. Discuss two dangers mentioned by Thorndike.
7. State the principles given by Thorndike in securing efficient execution or skill.
8. Illustrate the effect of delayed capacities upon the proper organization of manual arts teaching materials.
9. What bearing would Thorndike's "Attention and Execution" have upon early Swedish sloyd's insistence upon definite foot position in learning to plane? (The proper position of the feet is painted upon the floor and the student is asked to stand upon these markings.) Would you ever teach positions?
10. Discuss the principle of self-criticism.
11. Can you harmonize a seeming lack of agreement as to relative emphasis to be placed upon technic and skill in the readings in *Primary Handwork* and *Correlated Courses?*
12. Examine and try to classify the type of work described in each of the following:
    Dobbs: *Illustrative Handwork.*
    Buxton and Curran: *Paper and Cardboard Construction.*
    Griffith: *Correlated Courses in Woodwork and Mechanical Drawing.*
13. Examine back numbers of *Manual Training Magazine* and *Industrial Arts Magazine* for descriptions of different kinds of manual arts activities, and try to classify them.

CHAPTER III

INDUSTRIAL ARTS

1. Introduction. The term industrial arts is frequently used to designate a type of work long known as manual arts or manual training. As used in this text, the term industrial arts has reference to that type of educational experience wherein sufficient relative time and direction are given that it may adequately serve the needs of those boys who have definitely decided to enter industry upon leaving school, or may supplement the experience of those already at work in industry.

It is not proposed in this discussion to enter upon any extended effort at justification of industrial arts as a part of education or to explain the various forms of organization or administration which are to be found. These are fully treated in a companion volume in preparation. Suffice it to say that industrial arts finds a place in education as do agriculture, commercial subjects, medicine, law, engineering, etc., because society has need for trained workers in industry even as it has in these other lines of activity, and because an individual so trained makes a better citizen than if untrained. Industrial arts, with its early specialization, finds a place in elementary education because of the fact that those it seeks to aid cannot or do not remain in school thru the high school age, the age most suited for serious pursuit of vocational training. Figs. 2 and 4.

2. Three Types of Reactive Need in Industrial Arts Education. Reactions in the educational process come about thru (1) random movement brought about thru instinctive tendencies, (2) thru simple unconscious imitation, or imitation involving little original thought power, and (3) thru

reflective thinking wherein an analysis of underlying reasons is an ever important consideration.

The first type of reaction is a necessary stage in every effort at habit formation. However, it is an expensive method and one which may be reduced to a minimum by making use of knowledge obtained thru race experience. There will always be a sufficient amount of random effort without needlessly encouraging its kind. One may have all the knowledge necessary about learning to ride a bicycle but, as has been said, it is only by repeated trials that one learns to ride.

The second type of reaction depends upon a kind of intellectual activity which is a necessary part to the learning process but which has limitations when depended upon exclusively. Learning by or thru mere imitation with little attention to analysis and reason may make a very efficient machine tender or automaton; it cannot make for race progress. Used as a means and not as an end this type of thinking provides a valuable aid thru which to raise the child from one stage of development to a still higher stage. For example, a boy would have to spend much time to discover thru random experimentation all that goes to make up the knowledge and experience of a first-class carpenter. Thru exercise of the imitative faculty he may rather quickly be brought to an efficient stage of development as to knowledge of what the race has discovered about carpentry and as to mere execution of what others plan.

The third type of reaction is the highest—a type of reaction based upon an analysis of situation and a reasoning as to cause and effect. Here the subject-matter and method of procedure of the lower type are an essential part, but the horizon of mere practical expediency as to each specific experience is broadened into one of understanding thru generalized and systematized consideration of underlying prin-

ciples. The world has always paid highest tribute to this type of reaction. The laborer in the ditch may be, and is, doing a worthy work and should be suitably rewarded. The world has never paid him as it has paid the engineer who planned the project of which digging the ditch is a part, or the skilled mechanic on the job. It is hardly probable it ever will.

3. Basis for Awards in Industry. The author recently viewed a motion picture film the subject of which was "In Old and New China." In old China he saw men harnessed as animals to great, heavy carts loaded with heavy merchandise. Thin, gaunt men they were, with little clothing on their bodies and only a rag to protect their flesh from the heavy ropes at which they strained with all their might, a dozen or more men to each cart. Soon there flashed upon the screen a scene from new China, among other things a modern motor truck with liveried driver and a load of merchandise five or six times that being drawn by the dozen men, moving with apparently no human effort. Once we have analyzed the various factors involved in the makeup of these two scenes, we shall have determined the basis for awards in industry.

In an analysis of the situation in the illustration above we find representatives of each of the three types of reaction enumerated in section one. We find the common laborer, we find the skilled laborer, and, by inference, we find the intellectual, who may or may not have been greatly skilled in matters of execution in the realm of muscle, the man who designed or invented the truck. We also have, by inference, the capitalist. For purposes of this discussion the capitalist may be eliminated, since the type of reaction he represents is not greatly different in its origin from that represented by the inventor, the intellectual.

From this analysis we find, so far as our sympathies are concerned, the human animals of old China deserving of

the highest awards. Awards, however, are made according to economic considerations rather than ethical, as we well know. Further analysis will show that awards are made according to the educational investment the individual has made. It is in or thru the learning process that man makes his investment, and man learns practically all those things which place him above the brute creation thru the guidance of intellect. If, for example, one chooses to learn nothing more complex than tugging with might and main at a great rope fastened to a heavy load of merchandise, one may expect to find competition such that awards for service are reduced to means of bare existence. If he chooses to become a skilled mechanician and motor truck driver, he must expend time and energy in learning those things necessary for efficiency in this kind of work and in perfecting muscular coordinations.

Lest some one has hastened to the conclusion that efficiency in the learning process, like efficiency in habits already acquired, is a matter of feeling alone because of emphasis placed upon feeling in Chapter 1, the reader is reminded that in the learning process highest efficiency or skill comes about when the worker has been instructed in the best form for doing his particular kind of work, as handed down from generation to generation. The guiding in the assimilation of such form is the work of intellect. The truck driver had made a larger initial investment educationally than had the coolies. He had become skilled in driving and in motor truck mechanism, if he did it most effectively, thru intellectual investment as well as thru feeling, in that he had been instructed in the things the race had found out about motor truck mechanism and driving. His awards for service are proportionate to his intelligence and his skill.

What about the inventor; why does he secure so much greater awards than either truck driver or coolie? Cer-

tainly not because he is necessarily more skilled in the matters of muscular coordination in execution. In all probability he had a model-maker construct the model which he submitted to the patent office. Highest awards are given those who can perfect devices which will save time and energy and make for comfort and convenience for the race in ways not before known. This is what we call selective thinking as distinguished from that of the second type, that of the skilled mechanic, wherein thinking is chiefly a matter of association. So valuable or productive is this type of thinking, that the world rewards it highest even tho its owner may be inferior in matters of skill in execution in materials.

To revert to our illustration, it is the inventor of the truck who gets the highest awards. What has he invested educationally? True, some inventors are born with a type of mind which naturally puts things together in new ways; more inventors succeed by investing hours of time in developing the thing which afterward brings them great awards. Certain men are born with tendencies toward skill so that matters of birth may be neglected for purposes of evaluating the three types. The inventor makes his investments chiefly in intelligence of a certain type; it is this type which is the largest factor making for success or convenience of the race in guiding execution. In the final analysis, then, investment thru the learning process may be considered as the basis for awards. This investment may be in the form of increased intelligence or skill or both. Intellectual investment in turn may be of two kinds, common or associative and selective.

4. Industrial Education Must Provide Opportunity for Individual Specialization Along Any One of These Three Types of Reaction. Aristotelian philosophy proposed a social order of things wherein the social body was to be brought to a high state of economic perfection or efficiency thru the recognition of class distinctions. There were to be

the intellectuals, the skilled workers, the common laborers. Rewards were to be distributed according to class, intellectuals first and laborers last. Members of the classes were to be determined not by individual preference but by the dictum of certain members of the social order itself. Democracy cannot stand sponsor for an Aristotelian philosophy of industrial education. Democracy is based upon the principle of equal rights and equal opportunities for all. This being the case, opportunity must be open always for any boy to become whatsoever he wishes, whether it be intellectual or skilled mechanic or laborer. This opportunity for individual freedom of choice in the matter of future occupation is the distinguishing feature of a democracy from an autocracy.

Since a democracy demands equal opportunities for all, and, since the intellectual type has been able to command the highest awards, education in democracies has not infrequently drawn the conclusion that its work consists solely in the training of its young for this type. Education even in a democracy should provide for all three types of reaction mentioned above. There should be extended courses to develop mental grasp and technical skill, with emphasis upon individual welfare commensurate with the individual's later position as a citizen of the commonwealth. There should be shorter courses so directly planned and pointed toward industry and the other vocations, and taken at such early ages that individual welfare seemingly is sunk in specific industrial demands for a machine tender produced in the shortest possible time. The more extended courses are better, of course, as a general proposition. Limitations as to time and money available for educational purposes will largely condition the type of education a boy will be able to secure. Mental capacity and natural fitness will enter as factors. Just so long as wealth is as unevenly distributed as it is, and no greater provisions are made for the economically unfortunate,

education will be doing all it can for a large number when, thru such vocational experience it provides instruction in subject-matter and method in the shortest possible time.

Education in a democracy must do more than provide a course of instruction suited to those who expect to become members of the director class; it must also provide instruction for those going into the skilled labor class. For those who are unable to take such extended courses, it must provide a type which will better their condition in life, small tho this may be. Much of this must be offered thru part-time, or evening classes, and thru training on the job. There is a place for every type of reaction in the world's work: reaction with little mental effort, work wherein the employer does not desire a thinking individual and where a boy taught to think in the largest sense would be unhappy; reaction requiring somewhat more thought power; and reaction which demands a high degree of intelligence. Opportunities educationally are not equal when only that type of education is offered which the well-to-do and the intellectually inclined may secure; opportunities are equal when the various types are provided for.

5. Fundamental Principles of Teaching Applicable to Industrial Arts. What we shall teach is determined by social and economic conditions. This being the case, subject-matter must always have a large part to play in the determination of educational procedure. When it comes to a question of how we shall teach, we find a conditioning factor that modifies the emphasis which might otherwise be placed upon subject-matter. How we shall teach is, according to pedagogical principles, to be determined by child nature. This means that attention must be paid to individual needs and desires. These factors, educational subject-matter and child nature, tend to conflict; it is the teacher's problem to balance them as best he can, placing emphasis first on one then on

the other. For example, psychologically, education must grow out of the interests and desires of the pupils. If subject-matter is of such nature that the pupils' desires or interests cannot be enlisted within a reasonable time, then the process of education is in vain for those pupils no matter how logically the subject-matter may be organized or how valuable the experience may be from the social-economic point of view. On the other hand, desire must develop into efficient reactions, as judged by social-economic standards, just as soon as the developing nature of the pupils will permit. This means a growing emphasis upon subject-matter.

While the fundamental principles of teaching are applicable to industrial arts teaching, practice will be found to vary from that of manual arts for similarly aged pupils in matters of time allowance, emphasis upon certain methods of procedure, allowance for individual differences, ability to execute, etc., and in matters of relative emphasis to be placed upon thought provoking content and skill in execution, because of the fact that economic necessity forces children of certain classes to interest themselves in efficiency in adult activities before normal development would dictate. Normal growth of capacity for serious thought and action in social economic directions is as diagrammed in Fig. 4. According to this, serious emphasis upon efficiency, the aim of industrial arts, is not stressed until second, third, and fourth year high school age, and after a development of interest in, and feeling of need for, the same has been brought about thru activities more closely related to childish interests and capacity.

It is possible to develop a rather high degree of efficiency in certain kinds of industrial work requiring comparatively narrow skill and intelligence before the second, third, and fourth year high school age. It is possible to develop an interest in the acquiring of efficiency where the boy knows

he is headed toward industry and efficiency rather than appreciation. Boys can be induced to take interest in the making of large lots of equipment requiring much duplication of processes if they have developed a consciousness or feeling of need for efficiency along the line of some industrial pursuit.

Unless this feeling of need can be developed within a reasonable time, industrial education will be as profitless educationally as is any other type of education similarly affected. Knowledge upon the part of the pupil of the large place to be held by efficiency and the increased time allotment for the accomplishment of the same will make it possible for the industrial arts student to approach that 100 per cent efficiency, which the industrial world demands, much more quickly than it can be done thru manual arts with its smaller time allowances and its interests in things more personal or individual and less economic. Even in industrial arts training, however, as much time as possible should be allowed for the growth of skill and intelligence, so that industrial arts teaching is subject in this as in all other respects to the application of principles of education even as are the manual arts.

6. Effect of Emphasizing Efficiency in Execution, or Skill, in Industrial Arts Education. Efficiency or skill in execution can be accomplished only at the expense of attention to intelligence. The truth of this assertion has been developed in Chapter 1. For example, a quick way to develop efficiency in the framing of a half-pitch roof in carpentry is to take a framing square and show the student just how to place the square on the material, telling him just what numbers to take on the tongue and on the blade. After this has been done, the student is to be set to work putting this instruction into execution, repeating until the reaction is without thought, as it were. The psychological processes here are represented by paths number two and three of Fig 1. This example represents a type of reaction wherein intellect has a part, tho

not a very large part. Its part consists merely in recalling the instruction in the earlier stages of application.

A quicker means of developing efficiency in execution, and many otherwise good carpenters know no other, consists in the foreman's laying out the patterns for the various kinds of rafters after which the workmen come along and, using these patterns, lay out and cut the rafters needed. This latter type involves comparatively no thought upon the part of the workmen in so far as a knowledge of roof framing is concerned; it may well class as Path No. 1 of Fig. 1.

Continuing the illustration, our foreman himself as a rule has so neglected intellect in order to attend to execution that he has never taken time from execution to develop intelligence about the principles governing roof framing. He finds it easier to take the limited information given him, which information consisted of a statement of the rules governing the framing of rafters for the roof of the square cornered building, and then attend diligently to applying this. He would be non-plussed if required to frame or lay out rafters for a roof the frame of which was not square. Yet the fact is, that roof framing is a science as well as an art; once the principles are understood any kind of a roof can be framed.

Industrial arts can attend to the immediate development of a high degree of efficiency in execution; it does not of necessity have to confine its attention to this alone. Just as in the accompanying illustration from carpentry there was a type of execution involving little thought, a reaction involving more thought, and a reaction involving a high degree of thinking, so in any industrial arts practice we may have the same situations. Quite likely society will continue to make progress in the future as it has in the past by the maintenance of these three classes, those who specialize in science, the intellectuals of the crafts; those who balance science and practice, the skilled craftsmen; and those who are proficient

in execution but must have someone of the intellectuals do the thinking for them, lay out their work. The fact to be remembered is, that we may have efficiency in execution shortly but that it comes about thru the correspondingly early elimination of intelligence as it has to do with the operation under consideration. Efficiency may be delayed in industrial arts, but eventually it must be secured if the work is to class as industrial or vocational. It may take the form of directing others, or of executing what others direct, or it may balance these.

7. **Industrial Arts Education and Cultural Values.** Whatever the value or lack of value of industrial arts as a means of culture, its right to a place in the field of public school education must be conceded. Social, economic and other values justify industrial arts in education. However, there has been no small amount of discussion as to what effect, culturally, is produced by industrial arts educational methods.

There is no unanimity of opinion as to what culture really is: the most common feeling in the matter seems to be that culture, in common language, consists in one's capacity to appreciate the other fellow's point of view. If this is true, then industrial arts is cultural just to the extent it provides adequate opportunity for breadth of experience and view. The individual trained to immediate reaction in industrial lines requiring little thought, and who is never encouraged to supplement this with other worth while experiences, can hardly be said to be cultured.

On the other hand, an individual whose education and experience has consisted solely in academic training along some narrow line of intellectual activity can hardly be considered as broadly appreciative of the point of view of that large body of people who make their living thru working with their hands. Possibly the boy trained to efficiency in an industrial line, which training has included training in

related English, related science, hygiene, citizenship, industrial history, etc., can claim to be possessed of as much culture as can one who has spent an equal amount of time in training in purely academic subject-matter preparatory to college entrance requirements.

If culture refers to opportunity to do selective thinking, to stress intellect, the illustration from carpentry should make clear that industrial arts education may and does include that class we have called intellectuals as well as the class which depends upon non-intellectual reponses.

8. Dangers to be Avoided. First, there is the danger of trying to justify the industrial arts thru condemnation of the manual arts. A more reasonable view will recognize the legitimate place of manual arts as a means of developing breadth of experience and appreciation, and as a basis for future industrial arts experience should the student decide to enter upon an industrial pursuit as a means of livelihood. With the limited time devoted to manual arts, 90 to 180 minutes a week in the grades and not over 80 minutes a day in the high schools, industrial arts will not expect manual arts to be able to develop an efficiency equal to that which can be developed where one-half of each day is devoted to industrial shopwork. It will recognize that students with the manual arts experience with its limited time, tho losers in the matter of industrial efficiency, are gainers in other directions which, for those who are not going into industry, may be of more value than increased industrial efficiency.

A second danger lies in the confusion not uncommon in the minds of industrial arts advocates wherein they fail to differentiate low type industrial activity from higher types. For example, one may sometimes see bright, capable boys with time and money to prepare for better things spending days and weeks at developing efficiency in a type of production work requiring little thought. Sometimes the work re-

quires little skill as well as little thought. The fact that an educational situation is one from "real life" should not blind one to the fact that all real life activities are subject to differentiation into varying values educationally and economically. A student who has time and means, mental capacity and physical ability to enter upon industrial activities of a higher type should not be allowed, let alone encouraged, to spend large blocks of time developing efficiency in low type activities. If, for example, a boy with such time and money for preparation wants to follow carpentry as a life activity, he should be encouraged to enter upon a course of training which will be of such character that he may become a master in his craft rather than, what is called in derision, a jack carpenter, one who can do nothing which has not been mentally predigested for him by the foreman.

Conversely, there has been no small amount of confused thinking brought about largely thru failure to differentiate values placed upon certain experiences as educational means and the same type of experiences in real life. The fact that certain real life experiences of a low type have been selected for school use in training pupils who cannot, because of economic or other reasons, take a higher type, has led some educators to conclude that therefore such low type activities are an essential part of every individual's training and after-life experience—in other words, that equality of opportunity necessitates equality of classes in real life in the matter of work and reward. We speak of the dignity of common labor in our efforts to justify equality of opportunity. This is right, but equality of reward is another matter.

However desirable this latter may be from the standpoint of ethics, the fact remains that so long as rewards are given in a competitive market, the unthinking laborer cannot hope to fare as well as members of the director class whose places are won by the few who have added to a fair degree of skill

and understanding, power to think along new lines. The fact that originality and initiative are so productive as well as so rare is what causes the world to regard them and reward them so highly when they manifest themselves in time or labor-saving devices. An enthusiastic advocate* of vocational education of large salary may assert that he is willing to "get into the trench and do his share of the world's dirty work"; in fact, neither he nor any other man of equally keen intellect is getting into the trench. The world is not asking him to do this, for it can make better use of his talents as a member of the director class, as evidenced by the position and salary it gives him.

The problem is not one of making a president of the United States of every boy; neither is it one of requiring every president of the United States to get into the trench and do his part of the world's dirty work. It is one of providing opportunity for the full and free development of every boy, not neglecting the less fortunate who must occupy the humbler positions in life as the world classifies them. It is also an ethical problem of trying, in addition to providing opportunity for training, to provide means whereby the economically unfortunate may secure larger training than they otherwise could. Not every boy may become a Henry Ford in the industrial world. It is to be hoped a new day is dawning when, on the other hand, the Henry Fords of industry, commerce, etc., will recognize the fact that without the manual dexterity of the men in their factories their ingenuity and creative thinking would amount to but little. The laborer of low degree, and even the skilled laborer, has not always received his just share in the distribution of profits industrially. The director class too often has violated moral obli-

*Dean E. Davenport, College of Agriculture, University of Illinois, in address before Parents and Teachers Association, Oak Park, Ill.

gations in taking a share of profits which has left the common worker in poverty.

9. **Summary.** Industrial arts, then, may justify types of training and the placing of emphasis upon connections making for skill and efficiency without apology. It will not allow itself to be drawn into a false position of claiming a low type is a high type when it is not. Neither will it allow its adversaries to class all industrial arts education as necessarily of a low type. Industrial arts has its types which, to say the least, compare favorably with types of training in other lines in matters of science, intelligence, culture. While efficiency in execution largely distinguishes industrial arts from manual arts, efficiency may be delayed for purposes of developing intelligence in the work under consideration. In the final analysis, efficiency must be present if the experience is to class as vocational industrial, and the pupil must make use of such experience as a means of livelihood.

Reference Reading:

Judd: *Psychology of High School Subjects,* Chapters XII, XIII.
Leavitt: *Examples of Industrial Education.*
Bennett: *The Manual Arts,* Chapters IV, VII.
Dewey: *Democracy and Education,* Chapters XIX, XXIII.

Class Discussion:

1. What factor is emphasized in industrial arts which makes possible a differentiation from manual arts? What differences are there in purpose?
2. Discuss the demands for industrial education as enumerated by Leavitt.
3. Enumerate and evaluate each of the three types of reactive needs commonly recognized.
4. Distinguish industrial education of a democracy from that of an autocracy.
5. Is industrial education subject to the same fundamental principles of teaching as are the manual arts? Why then do we find decided variations in practice in the matter of interest, in subject matter, and methods of procedure?
6. Discuss the effect upon intellect of emphasizing efficiency in execution.

7. Is culture possible in industrial arts education?
8. Will industrial arts education bring about the elimination of class distinctions with an equality of reward? Why or why not?
9. What then, is industrial arts education with equality of opportunity expected to accomplish?
10. Discuss some of the dangers incident to industrial arts education.
11. Would you class as industrial education a type of school experience wherein children studied about industry and made replicas of certain factors as best they might. For example, a type wherein children studied about the steam engine, making steam engines out of materials such as they could work conveniently. Discuss.
12. Examine the work of a number of schools, as described in their reports, and discuss the value of such work from the standpoint of industrial training.

CHAPTER IV

INSTINCTS AND CAPACITIES

1. Instincts and Capacities. Instincts have been defined as natural, inborn tendencies toward definite actions along lines of racial development. A more understandable definition, possibly, may be obtained by referring to Fig. 1, Path 1, in the understanding of which we may say with Prof. Thorndike that instincts are unlearned connections. Capacities may be defined as connections possible but not in use. The kicking of the legs, the waving about of the arms, the crying of the newly born infant are examples of primary instincts. Ability to think, to walk, to talk are capacities—connections delayed in the case of the infant but nevertheless possible.

The significance of instinctive or unlearned connections is not always fully appreciated by prospective manual and industrial arts teachers. Whether such teachers will be happy or unhappy in their task depends in no small degree upon their understanding of the problem of the place of instincts and their means of control and utilization. Like teachers of other subjects, they will find themselves confronted by instincts functioning so strongly that to properly evaluate and utilize them for useful purposes will form one of the big problems of their teaching experience. Adults may choose to live thru Path No. 2, Fig. 1—thru reason and intellectual control of actions; children begin in, and only slowly grow out of, reactions controlled by instincts, connections largely lacking in reason and intelligence, Path No. 1, Fig. 1. Instincts in adult man may have been so subdued and placed under control of intellect and reason that, as Bergson says, other animals and insects are superior to man in the effectiveness of reactions controlled by instinct alone; in children unlearned

connections are sufficiently strong that at all times the teacher is called upon to exercise self-control lest at some unforeseen moment his own instinctive tendencies get the better of his judgment and reason. Whether a teacher is successful and happy in his teaching depends upon his recognition of the fact that instinctive tendencies give him the very foundation, the only foundation for his educational structure; that the stronger they are the better, provided he in turn has the strength to properly control and guide them into useful habits of behavior.

"Every acquired reaction," James says, "is, as a rule, either a complication grafted upon a native reaction, or a substitute for a native reaction, which the same object originally tended to provoke. The teacher's art consists in bringing about the substitution or complication, and success in the art presupposes a sympathetic acquaintance with the reactive tendencies natively there." Attention, then, is paid to instincts not as ends in themselves but as means whereby we may engraft other and more remote forms of reaction—reactions which racial experience has proven helpful to the individual or to society or both in enabling the individual or society the better to meet environment.

2. The Law of Association as it applies to the Utilization of Instincts. Psychologists have given us what they have chosen to call a Law of Association which is so helpful in the interpretation of the teaching problem, not only as it applies to the utilization of instincts but to all other connections, that it should be memorized for instant recall. It is not a law, as to the certainty with which the result can be predicted, as are the laws of physics and chemistry, because the limiting conditions are not so readily determined at all times. It is enough of a law to be most helpful in understanding and setting the teaching problem. The Law: The likelihood that any thought or act will follow another thought or act

is in proportion to the frequency, the recency, the intensity, and the resulting satisfaction of previous connections, other things being equal.

The significance of this law when applied to the engrafting of remote useful reactions upon instincts is simply that, if certain remote forms are wanted, they must be connected with original, unlearned or instinctive reaction often; with not too much time allowed to elapse between their connection and the present; with a vitalness of connection that tends to burn itself in; and, withal, a feeling of zest or pleasure. Not all of these factors may be present at any one time, but the chance for future like connections will be increased just in proportion as they are present and strong. "Other things being equal" is simply another way of saying that the conditions, in general, must be similar if the reaction is to be certain as to similarity to previous reaction. If one is tired or worried things may not be equal were the connections previously made when fatigue was not a conditioning factor, etc.

It must have been noted that this law presupposes *previous* connection. Occasionally a student will ask how the first or original connections are made. This is a fair question, tho the answer has been given. Original connections are native, unlearned. The order is: first, random movement or spontaneity, then comes the opportunity for engrafting or the making of learned connections as distinguished from unlearned. The question is not only a fair one but one that serves well to emphasize the absolute dependence of all remote forms of reaction upon immediate or instinctive forms at some time or another.

3. Instincts Need Control. Philosophers in times past have taken two widely divergent views as to the moral nature of instincts. There are those who thought children were by nature bad and that it was the part of education to make them good by thwarting native tendencies. There were those

who believed and taught that children were by nature wholly good and that education consisted in letting the unlearned connections find expression without hindrance.

This latter view was that of Rousseau as expressed in his earlier writings; the former view was that of the churchmen and schoolmen who preceded Rousseau. Philosophers, today, are generally agreed that children are by nature neither wholly bad nor wholly good but are to a large extent influenced for both good and evil by their ancestry. Mental activity, for example, may be utilized to think out the solution of a problem of social helpfulness, or it may be used to think up some new way to torment teacher or fellow pupil. Physical activity may be directed to the work of squaring-up stock for a given useful project and thereby give to the worker certain habits of mind and body useful in enabling him to make a sled he wants sufficiently well to withstand the rough usage to which boys subject sleds, or it may be directed toward mischievous ends, such as cutting desks, breaking tools, etc. Ownership may be utilized to motivate the acquiring of good technic or it may find expression in common theft, etc., etc.

4. Means Used to Control Connections between Instinctive and More Remote Connections. Of the means used to control instinctive connections or connections between instinctive reactions and reactions more remote, the following are common:

1. Guidance or substitution,
2. Neglect or disuse,
3. Inhibition or punishment.

Among other instincts are those of curiosity, physical activity, ownership, sociability, emulation, fighting, independence, kindness, mastery, manipulation, mental activity. Let us illustrate means of control in two of these instincts: curiosity and manipulation. Any shop teacher knows that the first day

boys enter shop for the first time, if they are just natural they will open and slam vises, handle tools, and in general investigate every thing that catches eye, or ear, or hand. The noise is deafening and tools as well as the hands of the pupils are likely to be damaged.

Are curiosity and manipulation here undesirable traits of character or possession? The novice might say that they are; the wise teacher, however, sees in such actions the manifestation of instincts of such strength and direction that he immediately plans to utilize them for ends other than mere noise and manipulation. He does not so much regret their appearance, for he has plans for changing their direction toward useful ends; he may wish certain connections making for restraint, formed in the academic school room, had partially carried over in a manifestation of greater respect for tools and materials of the shop. He knows, had there been no curiosity upon the part of the incoming class, that the teacher's problem would have been a most difficult one. It might of course have been present without manifesting itself in such noisy and immediate manipulation. Sticks make poor performers, whether they be of wood or of flesh.

To illustrate the application of the various means of control enumerated above, let us revert to the example of the preceding paragraph. When the boys rush in at the beginning of their first shop experience they may be kept from breaking tools, slamming vises, and taking chances of injuring themselves, first, by arranging the situation so that neglect or disuse shall obtain. This may be done by not placing the tools upon the benches until pupils have assembled and had instruction as to behavior desired. Vises may be fastened so that they cannot be slammed.

Second, the teacher may prevent their handling tools and vises by inhibition or punishment. This may be done by meeting the boys at the door and telling them before they

enter the room that they are not to handle tools or vises. In any well organized school such instruction carries the implication of punishment of one kind or another to come in case of disobedience.

Third, mere manipulation and unnecessary noise may be prevented by guidance or substitution. Guidance or substitution in this case may consist in providing other directions for exercise of curiosity and manipulation. One teacher, who has to teach grammar school mechanical drawing on the woodshop benches, prefers to leave all wood tools off the benches while the twelve lessons in drawing are being given. This is making use of neglect or disuse in so far as opportunity to exercise curiosity and manipulation on wood tools is concerned. Having taught respect for tools and equipment thru mechanical drawing, which has habits more closely allied to habits already formed in the regular schoolroom in matters of restraint, he can then connect his desired shop attitudes or habits, with their greater freedom of action, to the drawing habits with less need for dependence upon mere authority and fear of punishment.

Where shopwork is not made to wait upon mechanical drawing, probably as easy a way as any, where the teacher has the confidence of the pupils thru reputation (pupils usually have a teacher's measure before ever they enter his classes thru acquaintance with pupils who have been in his classes) is to call the class to order as soon as they have entered the shop and give instructions as to conduct. Some very good teachers prefer to let the pupils enter the room unhindered, handle the tools and slam the vises, calmly waiting the tap of the beginning bell when they proceed to set the house in order by a combination, as it were, of several of the means mentioned above.

It must be recognized that certain of the means mentioned above are more desirable than others. In order of desirability

substitution or guidance comes first. Keep a child busy and he will cause little trouble thru the manifestation of undesirable tendencies. Keep him busy upon useful or well-directed activity and he not only causes little trouble but is actively engaged in the educative process. Neglect or disuse is second as a desirable means. It is negative, as it were, in that it fails to make use of the driving force of the instinct it seeks to overcome by neglect. Neglect was suggested in the illustration above of the drawing teacher, in that tools were not placed upon the benches. With reference to learning about wood tools thru the exercise of curiosity, there was a loss. In this case, of course, there was a gain thru directing curiosity and manipulative tendencies toward mechanical drawing tools and processes. Since the woodworking tools were to be introduced later the loss mentioned was one of time only.

Inhibition and punishment (punishment of any kind, such as removal of privileges as well as corporal punishment) should be used as a last resort, in general. Appeal to authority (that is what inhibition and punishment amount to) may be maintained successfully for short and infrequent intervals, such, for example, as the shop teacher's telling the entering class to leave the tools and vises alone, that they would be given opportunity to learn all about them and manipulate them in time. Inhibition and punishment are costly and uncertain means for they violate resulting satisfaction, the most important factor in the working of the law of association. To violate resulting satisfaction means that greater appeal must be made to frequency and other operating factors in the law of association to compensate for this loss. The excessive strength of the factor of resulting satisfaction is such that very many repetitions will be required as a rule to counteract its loss.

For example, it is a matter of common observation that a child will secure a stronger or more lasting connection thru

doing a thing once when it is connected with something instinctively pleasant than thru doing the same thing a dozen times when the thing is not connected with something intrinsically interesting but which is done thru fear of punishment of one kind or another. Connections made thru authority with fear of punishment as the incentive rather than resulting satisfaction are uncertain, for the moment authority is removed the chances for a repeat are unfavorable.

5. Conflict of Aims in Utilizing Instincts. As in teaching other subjects, so in teaching manual and industrial arts it is not uncommon to find flagrant violations of the principles of good teaching, as indicated in the law of association applied to instinctive connections. Frequently, however, such violations are not the result of lack of knowledge upon the part of the teacher but rather the result of the necessity for having to choose between conflicting aims, neither solution being possible without a sacrifice. For example, certain teachers recommend the making of models by the teacher and the placing of these about the walls of the shop in orderly sequence. The aim here is to make for clearness of thinking upon the part of the pupil.

There is a question, however, as to whether the gain in clearness of thinking thru the pupil's being able to see the year's work at a glance compensates for the loss of interest thru the immediate unfolding of the work of the year and the consequent destruction of curiosity as to what comes next, an important factor in keeping the pupil keyed-up to the work in hand. Before the work of any teacher is criticised or condemned for violating certain factors of the law of association as it has to do with the utilization of instincts, the observer should make certain the violation is not justifiable thru extra values obtained thru emphasizing other conflicting factors. Keeping a pupil after hours as a punishment for not making certain connections desired in school hours may violate the

law as to resulting satisfaction thru connection in the mind of the pupil of ideas of dissatisfaction with the work of the school, a connection not to be desired.

On the other hand, if such punishment serves to make the pupil take greater satisfaction in making the proper connections during school hours, it may have justified itself. At its best, of course, it is but a makeshift justifiable only with the few who are not subject to reasonable teaching situations. A proper setting of teaching conditions should make for resulting satisfaction upon the part of the class as a whole with but few exceptions.

6. **Effect of Delayed Capacities.** The teacher of manual or industrial arts needs but to recall his own experiences to be made aware of the fact that various capacities mature or become available gradually. Unfortunately, many adults have lost the ability to see themselves as they were as children at various stages of development. That teacher of manual arts who seeks to emphasize extreme accuracy and skill in primary grades evidently has failed to recall that the capacity to appreciate a need for a high degree of accuracy and skill is not likely to manifest itself until children have had more experience of a random character. Then, too, the capacity to execute with skill is not present with small children, especially the capacity to execute fine movements. The teacher of industrial arts who seeks to make mechanics of mere children finds this a difficult problem. Children of early grammar grades are lacking in capacity to execute in materials, to use mechanical judgment, and in ability, as a rule, to appreciate needs.

If the teacher must arrange his work so that pupils are not required to make use of capacities before they manifest themselves normally, he must also see that capacities are considered when they do manifest themselves. The teacher of manual arts who is so interested in expressional manual arts

that he or she overlooks the fact that there comes a time when children become interested in, feel a need for, and are capable of executing work according to conventional methods of procedure,—such a teacher is pedagogically as inefficient as the one who forces experiences before they may be had with economy of effort. Again, that teacher who fails to so plan his work that pupils may have opportunity to exercise reason and judgment in the execution of original work because he has found such a capacity rather weak in earlier years, is not fully appreciative of teaching opportunities.

Not infrequently there will be a conflict of instinct and capacity. The desire of grammar school pupils to make large and intricately constructed pieces of funiture is an example of the instinct of ownership running counter to capacity to manipulate tools and materials. The problem here is one of directing the instinct of ownership toward simpler things until capacity to execute the more difficult things comes to pass.

A not uncommon question for debate is as to whether children should work upon projects intended for home use or on projects intended for the school. One offers the instinct of ownership, another offers the group or social instinct. The problem usually resolves itself into a question not of which is better, but rather which must take precedence because stronger. There are certain stages in development when the instinct of individual ownership is stronger, other stages when it is not a question with the pupil of mine alone but of the family and home. Pride in things civic comes later, and often needs just a little forcing to make it appear at all strongly. Good teaching will recognize each of these instincts as legitimate means of motivating work, not as ends in themselves but as means of giving to the pupil experiences of value at appropriate periods in their development as judged by society.

7. The Teacher's Problem. This, then, is the teacher's problem: to take what he finds nature and nurture have pro-

vided his pupils, when he gets them, and to strive to engraft other remote forms of useful habits of behavior, as he has time, and as the natural development of his pupils will permit.

8. **Summary.** Instincts are unlearned connections; capacities are connections possible but not in use. Whether a teacher will be happy in his task depends, in no small degree, upon his understanding of the place of instincts and the means of utilizing them for useful purposes. Attention is paid to instincts not as ends in themselves but as means whereby we may engraft other and more remote forms of reaction, forms which society has determined are good for the individual in preparing him to become a member of its body.

The law of association applies to the utilization of instincts for educational purposes. If we want a pupil to take interest in a remote connection, one not natively interesting, we must make connections between some activity natively interesting and the remote activity with frequency, recency, intensity. The resulting satisfaction inherent in the native reaction will tend to become attached to the remote reaction.

Instincts need control for they are not always sure guides. Means used to control instincts are guidance or substitution, neglect or disuse, inhibition or punishment, enumerated in the order of desirability.

Not infrequently the teacher in his attempts to utilize instincts as means of motivating work finds that the utilization of one instinct conflicts with that of another. In such cases, all that can be done is to weigh the resulting values one against the other and choose the one giving the greater returns.

A good teacher will recognize that certain capacities are delayed and will so plan his work that abilities shall not be called upon until their time for normal appearance. To do otherwise, is to demand unnecessary strain. On the other hand, work should be so planned that instincts will be placed at work as soon as capacity has matured; to do otherwise is

to neglect valued assistance. In the conflict between instinct in one direction and lack of capacity in another, the teacher will favor the lacking capacity by directing the instinct toward more reasonable reactions.

The teacher's problem is one of taking the child as he finds nature and nurture have prepared him, then striving to engraft upon these habits other useful habits of behavior such as the race has determined are good for the child in enabling him the better to meet his environment.

Reference Reading:

Thorndike: *Principles of Teaching,* Chapter III.
James: *Talks to Teachers,* Chapters III, VII.

Class Discussion:

1. Define instinct. Define capacity. What has education to do with these?
2. Thorndike mentions the following instincts: Mental activity, curiosity, physical activity, manipulation, collecting, ownership, sociability, emulation, kindness, pugnacity, mastery, independence, defiance. Illustrate.
3. If instincts are not to be neglected, are they always sure guides? Illustrate.
4. Thorndike mentions the following capacities: Impression, expression, connection, selection, analysis. Also the following complexes: Management of things, of men, of concrete ideas, of abstract ideas and symbols, self control, energy, precision, thoroness, originality, co-operation, leadership, self-denial, self-reliance, refinement, sympathy. Illustrate.
5. What is meant by self activity? What is meant by the expression "directed self-activity, not self-directed activity?" What part has the teacher to play in each?
6. Are you agreed that "activities of neglect, inhibition, and guidance are even more important than activities of impulsion"? Would you vary your answer were a distinction to be made between elementary education and advanced college? Are you agreed "that success is in a great measure not making failures"?
7. State the means used to control instincts, and differentiate as to desirability.

CHAPTER V

APPLICATION OF THE PRINCIPLE OF APPERCEPTION TO MANUAL AND INDUSTRIAL ARTS TEACHING

1. **Apperception.** Apperception, Professor James tells us, is a very big word for a very simple fact. As one writer states, "It means simply that if you want to go somewhere you must start from where you are." It is the process of assimilating new ideas and habits by relating them to old ideas and habits.

Simple as this is in statement, it is not so simple when we strive to apply it. The teacher of design who gathers up all the books in the library relating to a problem in design for fear his pupils may go to them for suggestions evidently does not understand its meaning. Rather, that teacher understands it who keeps in a filing cabinet mounted prints of every thing good bearing upon that particular problem, let it be a piece of pottery, a piece of furniture, or anything else, and encourages his pupils to study such designs before making an attack. Design is nothing more nor less than combining old elements in new ways—even the Creator had the elements out of which to create worlds, we are told. There *is* danger of copying—this however, is less where pupils are properly taught than where they are asked to make bricks without straw, as it were. There must be in the minds of the pupils design elements before designs can be made. If these are not there they must be got there thru a relating of new ideas to present ideas, or new feelings to present feelings.

"What anyone thinks, or feels or does on any occasion depends upon what he has thought or felt or done in the past." If a boy, operating a universal saw in a wood shop, should be told to remove the guard, he would, without doubt, act at once and as desired. If the same instruction were to be given

in some foreign language, he would probably be non-plussed. To get him to react as desired it would be necessary to begin with ideas that were known to him and to connect up these new sounds with those ideas before appropriate reaction could be secured.

2. The Learning Process. Froebel, long ago, gave the following order which is recognized today as a complete statement for ideal method: (1) spontaneity, (2) instruction, (3) creative effort. Note the order. Compare this order with that of Path No. 2, Fig. 1.

Not only is Froebel's order characteristic of the small arc representing any one stage of child activity, but it is also applicable to that larger arc covering the period from birth to manhood. Both organization and method of manual arts teaching are affected by these facts. Note the following:

"1-6 Years—Period of spontaneity characterized by excess of feeling, expressed thru motor."
Implication—little need for formal school instruction.

"6-12 Years—Period of spontaneity characterized by excess of feeling, expressed thru language, as reading, writing, arithmetic, spelling."
Implication—manual arts in the main will be used as a means of teaching other subjects—expressional and illustrative. Technical manual arts begins but is minor.

"12-18 Years, Grades VI, thru H. S.—Period of knowledge, scientific reasoning, characterized by excess of effort, expression thru both motor and language."
Implication—emphasis upon technical manual arts, a study of the science or conventions together with plenty of opportunity for application in shop.

"18—Period of will, creative effort plus interest; expression thru language and motor, in most men thru motor."
Implication—trade training, automatic habit formation, emphasis upon skill.

3. The Law of Association Applicable to the Learning Process. The law of association indicates clearly the problem of making effective the process of connecting up new ideas or new habits with old ideas or habits. Situations must be set so that the pupil will make the desired connections with frequency, recency, intensity, and with resulting satisfaction.

If we want a boy to acquire skill in the making of a mortise-and-tenon joint, for example, we can do so by having him make a number of joints of the same kind, frequently. This alone, however, may not be sufficient; if he sees no need for such activity, frequency may be more than offset thru lack of resulting satisfaction. Let him make his duplication in the form of a taboret or some other object he wants, and frequency combined with resulting satisfaction, and probably intensity, will result in the skill desired by the instructor.

4. Some Seeming Violations of the Principle of Apperception. If the principle of apperception means anything, it means from the simple to the complex. In older manual training practice this was taken to mean that a series of joints, parts, must be made before the application, whole, could be made. Consequently we had planing exercises, sawing exercises, chiseling exercises, and joints galore before a single application could be made. We had this same counterpart in academic practice—the alphabet with various sound combinations used to be taught before any reading would be allowed. Similarity in writing, certain abstract and detached strokes had to be mastered before any letters or words could be written. The fallacy of all such practice lies in the assumption that it is impossible to get wholes of sufficient simplicity that they may be taught as wholes in the very beginning. Certain wholes in shopwork are easier to construct than certain parts. A simple one-piece key-rack is much easier to construct than a dovetail joint, a part of a table or cabinet. The chief weakness, however, lies not so much in the exercise as an exercise as in the fact that there is not the resulting satisfaction that is carried with a whole, a something of use, and that the making of certain parts is not always, nor even often, the same thing as making these parts in a whole.

On the other hand, if exercises are not always necessary precursors of application, there are too many supervisors who

have a notion that therefore, they are never permissible or advisable. To be sure, we should, as a general proposition, put things together as we expect to have them put together later. For example, that teacher who had his boys square up edges and ends on a sleeve board for the sake of giving additional practice in squaring up stock, when these edges and ends were to be cut off in making the curves, need hardly be surprised to find these boys going thru this needless operation when later they are called upon to make sleeve boards—they were taught such associations, and by the workings of the law of association, will tend to repeat such associations unless something very intense has been done to break such connections. To say that exercises are always bad is hardly wise. The fact that attention can be centered upon one difficulty at a time, and that both time and valuable material are often saved by the preliminary exercise, makes its use well worth while, once the pupil has had enough simpler experience, simpler wholes, to have been forced to a feeling of need for such preliminary exercises. While a child may learn to read readily by means of the word-sentence method there comes a time when the alphabet should be taught. A fourth grade girl could not locate a desired word in the dictionary because she had never been taught the sequence of the letters of the alphabet, tho she could read beautifully.

5. Logical Sequence. While the aim should always be from the simple to the complex, it should be understood that many times one process is as difficult to master as another. Whether, for example, accurate sawing to a line should come before accurate planing to a line is not so much a matter of relative difficultness—one is about as difficult as the other; the essential thing in such cases is to so plan that one difficult thing will have time to become assimilated before another is introduced. In such cases one can afford to be liberal as to which process shall be taught first. When, however, it becomes

a matter of free sawing parallel to a line, as when planing is to be done afterward, there is no question but that such free sawing should come before the more accurate sawing to a line.

Manual training and industrial arts teachers are frequently confronted today with the demand upon the part of superintendents that they conduct their work upon the basis of project

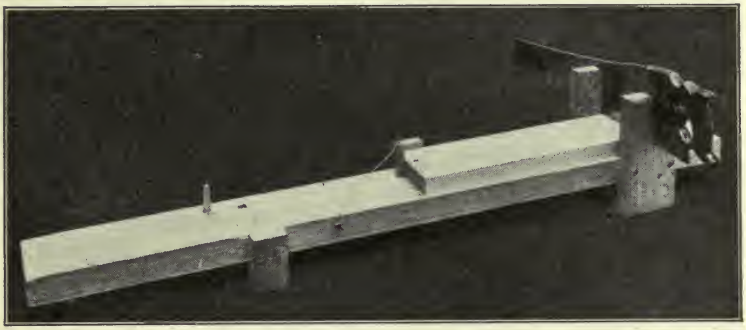


Fig. 8. Cutting-off Jig.
Courtesy of E. E. MacNary, Springfield, Mass.

or problem, or job rather than process arrangement. So long as freedom of choice as to project is allowed, it is possible to maintain orderly arrangement of processes, from the simple to the complex, without violating any of the controlling factors in the working of the law of association as applied to apperception, or to the learning process. Those superintendents, however, who arbitrarily select projects and insist that the manual training or industrial arts teacher have his boys execute the same forthwith, are, to say the least, not dealing fairly with the teaching of manual or industrial arts. Manual and industrial arts teaching is governed by identically the same laws as govern the teaching of other subjects. It is doubly important that conditions be favorable for the proper

setting of the teaching problem in manual and industrial arts for manual and industrial arts deal with such resisting materials that violation of the law of association must mean defeat of a nature that cannot be concealed from those who know what the proper results should have been. A superintendent would hardly ask a beginning Latin class to attempt to translate Virgil or Cicero, yet he not infrequently demands that a beginning manual training or industrial arts class build pretentious pieces of apparatus before they have any basis in technical understanding or well controlled muscular habits for such activities.

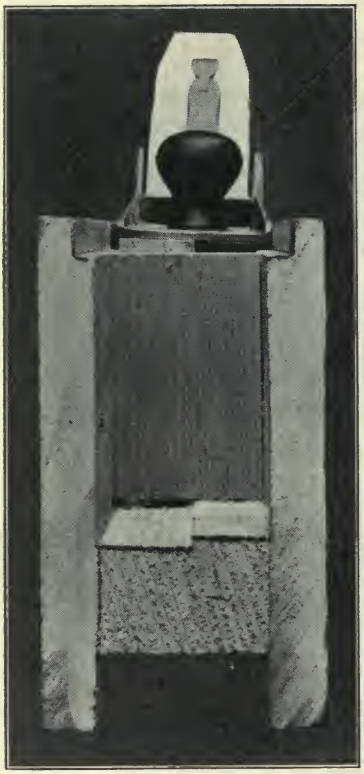


Fig. 9. End View of Planing Jig. Courtesy of E. E. MacNary, Springfield, Mass.

The discussion of the preceding paragraph is based upon the supposition that the work is organized to develop technical insight and mechanical skill of hand. It is possible by means of jigs, Figs. 8, 9 and 10, to so simplify requirements for skill of hand and technical understanding that mere children can be got to produce quite imposing pieces of work. School superintendents not infrequently confuse educational values obtained from this type of work with those of that type intended to develop skill of hand. The use of jigs is legitimate and the experience gained has value. It is, however, no adequate

substitute for those values which come thru handwork without the excessive use of jigs. The relative value of the two types of training has been touched upon in the chapter on industrial education.

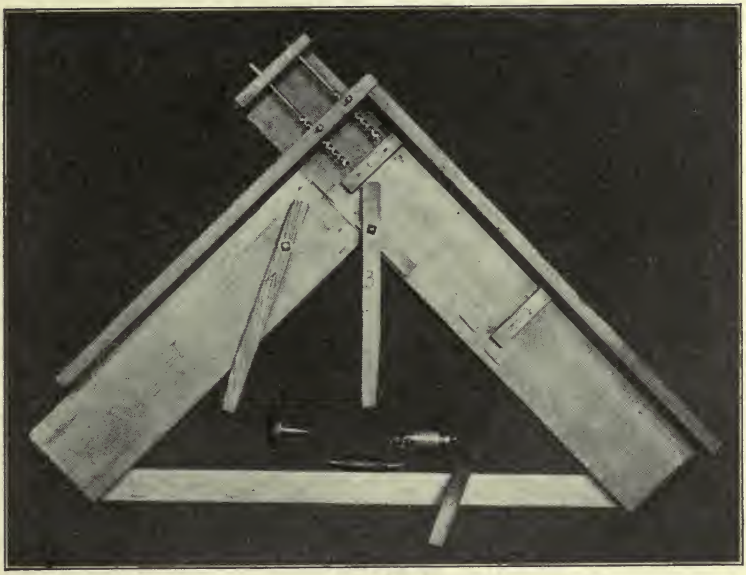


Fig. 10. Boring Jig. Courtesy of E. E. MacNary, Springfield, Mass.

Rewards, as has been said, are commensurate with educational investment. If the pupil makes a hurried investment in skill thru the use of jigs, he will not be able to realize upon this investment as will the pupil who makes the more expensive investment, as to time and energy, in the development of skill in intricate mental and muscular coordinations. A machine tender or a mechanic of a mill wherein the work requires small skill thru the use of jigs does not receive a remuneration equal to that of the mechanic on the job wherein

wide skill or muscular coordination is required. This latter skill must, of course, be marketable. Skill for skill's sake is of small value. It must also be a skill not capable of ready duplication by machine processes. Whether the work is production by jigs or production by skill of hand, attention must be paid in each to orderly introduction or sequence of subject-matter. Sequences when the work is done by the use of jigs should not be confused with necessary sequences when the work is to be done thru development of skill of hand in free manipulation of tools. The value of jigs as an economic factor in production is not to be questioned, of course; and their use in the school course for purposes of attaining certain objectives, such as the giving of information about, and experience in quantity production, must be recognized, also, their use as a preliminary to attainments of skill of hand, as a means of setting up standards and feelings for proper muscular co-ordinations must be considered.

6. Drill or Frequency as an Essential Factor in Assimilation. Teachers of technical work in the grammar grades are prone to forget that frequency is an important element in the extent to which a new connection in ideas or action will become assimilated. This, no doubt, is due to the excess of motive or impulsion upon the part of young pupils—the intense desire to be undertaking something new. It is no uncommon thing for a grade school boy to have had all the fundamental tool operations taught him, followed by such joints as dado, cross-lap, glue, mortise-and-tenon, etc., in the making of large pieces of furniture. There are always the exceptions, of course, but in all probability not fifty per cent of a class having but two and one-half hours or less per week will have had sufficient repetition, arranged, of course, to give resulting satisfaction, to have mastered such joints so that the high school teacher can presuppose such mastery and plan his work accordingly.

7. Summary. Apperception is the process of assimilating new ideas and new habits by relating them to old ideas and habits. "What one thinks or feels or does depends upon what one has thought or felt or done in the past."

Froebel long ago gave the order of procedure to be followed in the learning process which order is recognized today as a complete statement for proper method where time is available for the highest development of the individual: (1) spontaneity, (2) instruction, (3) creative effort. This order is characteristic of the large arc covering the period from birth to manhood as well as the smaller arc representing any one stage of development.

The law of association applies to the learning process, for assimilation is nothing more nor less than association—association of new ideas with old or new habits with old.

If the principle of apperception means anything, it means from the simple to the complex. This has been taken to mean that abstract exercises must always precede projects or completed wholes. Experience has shown that children get greater satisfaction thru making projects than thru making exercises. Elementary manual and industrial arts should consist of project work rather than exercise. This can be accomplished without violating the principle of apperception; it is perfectly possible to have projects so simple that they may be made without preliminary exercises. On the other hand, the difficulties children meet in dealing with simple projects serve to cause them to see the need for preliminary exercises for certain advanced project work. When this situation obtains, exercises are legitimate and pedagogically proper.

Application of the principle of apperception implies attention to proper sequence. Project sequence instead of process sequence may serve as a basis of organization of subject-matter provided choice of project or choice of time for introducing any required project in the course is left to the teacher

or supervisor of the shop or drafting work. When this is done the teacher or supervisor may preserve necessary sequence so that the principle of apperception may not be violated thru having to introduce the children to intricate processes before they have built up any adequate basis in past experience for assimilation. Sequence, where jigs are employed should not be confused with sequence where dependence is placed upon skill of hand.

Drill is an essential factor in assimilation. Drill is the frequency factor mentioned in the law of association. In all drill it should be remembered that frequency so arranged as to be accompanied by a feeling of satisfaction is very much more effective than drill not so accompanied.

Reference Reading:

Thorndike: *Principles of Teaching,* Chapter IV.
James: *Talks to Teachers,* Chapter XIV.

Class Discussion:

1. Define apperception.
2. State the law of association.
3. From observations state how a teacher prepared the minds of the pupils for a new idea which he desired they should acquire.
4. From observations state how a teacher prepared the bodies of the pupils for a new habit in muscular coordination in constructive work.
5. What suggestions have you for a better or more efficient presentation of the problems of 3 and 4?
6. Discuss the application of the principle of apperception to the teaching of design.
7. "From the simple to the complex." How do you explain the fact that we begin with wholes rather than with parts in our teaching. For example, in reading we teach words and sentences before we teach the alphabet. In woodwork we teach pupils to make bread-boards, etc., rather than abstract planing and sawing and joint exercises.
8. Discuss: "To proceed to the unknown is as important as from the known." Make an application to some manual arts problem.

CHAPTER VI

INTEREST AND ATTENTION

1. Interest and Attention the Indispensable Basis of Every Method of Education. The place of interest in education has caused no small amount of debate among educators and of confusion upon the part of the young teacher. Most of the lack of agreement has come about thru a lack of agreement as to what is meant by the term interest. For the sake of clearness we may assume that interest and attention are one and the same thing; that we are in this sense always interested in what we attend to. The boy who cuts the grass when he doesn't want to do so, because he knows a whipping will follow his neglect, is interested in what he is doing—interested to the extent that resulting satisfaction is greater in doing the unpleasant task than it would be in taking the whipping. The distinction we debate about, then, is not one of interest or lack of interest, but interest or attention with or without a feeling of intrinsic desire or zest. If we attend to a thing we must be interested in that thing.

Now mental assimilation is a matter of consciousness. Consciousness and attention are one. So long as we are conscious we are attending to some one thing or another. The problem of education is the problem of getting the student to attend, to take interest in the thing that society thru the school and the teacher has determined is good for the student in preparing him for future life as an individual and a citizen.

Unfortunately, experiences which society feels the child ought to have are not always such that the child fully appreciates their need, and therefore they do not have for him a feeling of zest in their accomplishment. When a child is

forced to do a thing for which he sees no need, he is, without doubt, making connections which society demands, but making them, as he does, with resulting satisfaction only in that it avoids punishment, the moment the fear and authority are removed, such connections will, to say the least, be weaker than those made with an accompanying feeling of zest and desire.

2. **The Law of Association Applied to Interest and Attention.** The educator's problem consists in hitching or engrafting reactions not immediately possessed of a feeling of zest, which reaction society has determined are helpful for the individual in enabling him the better to meet his environment, upon reactions which are immediately possessed of a feeling of zest. The law of association, then, may be modified to read: The likelihood that an individual will be interested in, or pay attention to, or have a feeling of zest in, a thing or act is in proportion to the frequency, recency, intensity and resulting satisfaction of previous connections between that thing or act and some thing or act which is natively possessed of a feeling of zest.

A grade school boy is not normally possessed of a feeling of zest in the making of working drawings. Let him be informed that only as he makes preliminary working drawings for certain pieces of woodwork, can he be allowed to attempt such pieces of woodwork, and the beginnings of a practical application of the above rule are being made. A high school boy has a desire to make a library table. The instructor wishes him to acquire tool technic in the making of a mortise-and-tenon joint. The teacher can get such a boy to make a preliminary mortise-and-tenon joint with a feeling of zest by associating in the mind of the boy the idea of the necessity for complete mastery of technic of the mortise-and-tenon joint as an aid the better to make the table.

3. **Feeling of Zest Versus Effort.** The fact that a thing

is difficult does not of necessity mean that its accomplishment may not be accompanied by a feeling of zest; nor does the fact that a thing is easy mean that a feeling of zest must be present. We like to do those things we can do well—those things in which there is a growing skill, a feeling of mastery—not so hard as to discourage, and not too easy.

The wise teacher will not seek to give easy experiences to his pupils under the mistaken notion that thereby he makes possible feeling of zest, nor, on the other hand, will he allow his pupils to plunge into deep waters of effort because they have an immediate interest in some thing manifestly too difficult for them at that stage of development. For example, ask a beginning class in woodwork what they would like to make, and not uncommon answers are: library table, hall clock, desk, etc. A good teacher will not ridicule such desires, but will utilize them as a means of attaching a feeling of zest or interest or attention to the simpler beginning projects by explaining that the desires are all right but that they will have to wait awhile until greater skill and understanding can be developed. This, he may explain, is to be got thru the making of simpler projects, which he will then introduce.

Prof. Thorndike's practical advice: "Get the right things done at any cost—but get them done with as little inhibition and strain as possible," is good advice to those advocates of a pedagogy so soft that it encourages pupils never to feel called upon to do anything which involves effort and strain, or to do some things thru a sense of duty, the doing of which is not immediately possessed of a feeling of zest. It is also good advice for those who ridicule the effort to attach a feeling of zest to tasks not immediately so possessed thru association of these tasks with activities or ideas natively so possessed —for those who glorify effort or strain as a discipline.

4. **Mental Assimilation a Matter of Consciousness.** In

a preceding section of this discussion the statement was made that mental assimilation was a matter of consciousness—this by Professor John Dewey. A proper understanding of this is necessary if those who advocate the doctrine of interest, or feeling of zest, as a necessary basis in every method of education are not to be confused in their practice and confounded by their adversaries.

It is possible to sugar coat certain mean tasting medicines and give these to children without their being made aware of the mean taste, only the sugary taste, and still secure a desired medicinal reaction. It is possible to have children develop certain useful muscular reactions under the guise of play. When it comes to a matter of connections involving mind or intelligence it is impossible to make such connections without the child's being aware of what is going on. For example, a boy wants a sled; society thru the school is not particularly concerned with the furnishing of a sled for that boy, or any other boy—that is the business of the home and the parent. Society, however, does want that boy to acquire certain useful industrial habits, among other things. It finds it can have the boy acquire these thru making the sled, and acquire them easier, or with less strain than thru a set of abstract exercises. What is the problem?—Not one of concealing from the boy a knowledge of the technical processes involved, but eminently one of fixing his attention upon them. So far as the boy is concerned this knowledge of correct methods of procedure is merely a means to an end—a means of securing a well-made sled. So far as society is concerned the sled is a means to another end—the acquiring on the boy's part of useful knowledge and habits. The sled was a means of motivating the technical work thru creating a feeling of need for technical knowledge and skill.

Some teachers are even frank enough to explain to beginning classes just what the situation is—a cooperative plan

whereby both society and boy may accomplish their aims and ends—one, the making of a more useful citizen, and the other, the sled. Mental assimilation here is a matter of consciousness upon the part of the boy. Contrast this with that type of experience wherein boys are given no instruction in proper technical methods of procedure but by some miracle are supposed to assimilate it unconsciously. It is not assimilated unless attention is centered upon it. This is the reason it is unwise to claim development of technical understanding and skill in expressional and illustrative manual arts where attention is so exclusively centered upon the idea to be expressed and not upon tool technic.

5. Abstract Exercises Versus Useful Projects. In sections 3 and 4 of Chapter V there was discussed the place of the abstract exercise and the useful project in manual arts teaching. The strength of an exercise lies in its permitting concentration of attention. Its weakness lies in its inability to secure an accompanying feeling of zest when required before the pupil has had any opportunity to try himself out and thus discover the need for such exercises as a preliminary to application.

The weakness of a series of abstract exercises not followed by application in a real project lies in the fact that connections formed in dealing with parts cannot be substituted wholly for connections formed in dealing with those parts in a whole. For example, we may give mature students a course in carpentry joint-making and hold their attention—even securing a feeling of zest. Valuable as this experience may be as a preparation it cannot take the place of the application of these joints in a completed carpentry project, such as a house or barn.

The question, then, is not one of abstract exercises versus useful project, for the answer is evidently abstract exercise *and* useful project. The question really is one as to the appro-

priate time or place of introducing the exercise so that it may take on a feeling of zest; this time is certainly after the pupil has had enough experience of a simpler kind to cause him to have a feeling of real need for such exercises as a preliminary to the making of his useful project.

6. Drill and the Feeling of Zest. By the law of association repetition or frequency is an essential factor in fixing connections, in other words, drill. No little confusion exists as to the merits of drill. One educator conducts experiments in spelling wherein one group of students is drilled and another group is not formally drilled, and proves to his satisfaction that drill or frequency is of no value. An examination of the facts in the situation would probably show that the deciding factor was not frequency so much as resulting satisfaction. While repetition or frequency has value always in fixing connections it has its greatest value only when accompanied by a feeling of real need and a feeling of zest and resulting satisfaction. A few connections with intense resulting satisfaction will fix those connections better than a very large number of repetitions or frequencies not so accompanied.

For example, a certain instructor decided that he wanted to develop skill in accurate sawing. He took as one of his earliest problems in the course what he chose to call a counting board. Now, his pedagogy in choosing the counting board, or a so-called useful project, was all right. He also conceived the idea that, if skill in sawing was to be developed, there must be repetition or drill, so he planned his stock that the boy would make a rather large number of preliminary saw cuts before making the final cut, Fig. 11. By every element of logical reasoning each cut should have been better made than the preceding, and the last cut the best of all. In actual teaching practice, the beginner made the first cuts with a certain degree, or lack of degree of accuracy, but as a rule

the cuts got worse instead of better. Noting this fact, not a few boys exercised *their* reasoning "faculty" and skipped the intermediate cuts making the final cut without further delay. What was the trouble? As a Normal school problem, this logical analysis and presentation of the problem would be

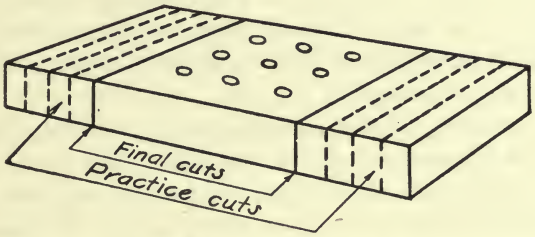


Fig. 11. Game Board.

found to work. It didn't work as a beginning problem in seventh grade woodwork because these boys had not enough experience to have developed a feeling of real need for the preliminary sawings, and most of all, these preliminary sawings interfered with getting at the game board, which was the thing that interested them.

Should there be drill, or frequency, in the making of connections desired? Yes, but so planned that it has meaning. Eight abstract dado joints should not be made in an eighth grade. One preliminary joint can be made to function here, but, after that, let the repetition be made in the form of a taboret, a bookshelf, etc.—some project wherein the boy will constantly feel the need for his best effort on each joint. Engineering schools, even, are abandoning long continued series of abstract exercises, for even mature men do better where there is some incentive for drill other than the mere acquiring of efficiency.

7. Logical Arrangement of Subject-Matter Versus Psy-

chological Development of the Individual. The discussion of the section just preceding should have developed the idea that logical arrangement of subject-matter does not always harmonize with the developing nature of children. In such cases there are often found two extremes in educational practice—one, which disregards logical arrangement of subject-matter in its eagerness to gratify every native tendency of children; the other extreme is that which breaks children by inflexible authority until they fit into this logical arrangement of subject-matter.

Good pedagogy recognizes this conflict in aims of society and native interests of children and so plans that it may begin with emphasis on the latter and by associations transfer these native interests to those things society demands of an educated individual. Society determines what shall be taught; child nature, psychology, determines how this shall be taught.

8. Summary. It has been said that interest is the indispensable basis for every method of education. For the sake of clearness we may assume that interest and attention are one and the same thing. An individual, then, is always interested in anything to which he attends or of which he is definitely conscious. Interest or attention may be accompanied by a feeling of zest or desire, or it may not; it is to this feeling of zest we refer when we speak of interest in a popular sense, as in the statement above.

The problem of education is one of getting children to attend, to take interest in the things society, thru the school, thinks best for the pupil in preparing him to meet environment, and to do so with an accompanying feeling of zest. The law of association makes clear how this problem is to be solved when we apply it as was designated in the chapter on instincts just preceding. The likelihood that any remote reaction will be possessed of a feeling of zest is in proportion to the recency, the frequency, the intensity, and the resulting satis-

faction of connections made between the remote reaction and reactions immediately or natively possessed of a feeling of zest.

Not infrequently, ease of accomplishment is confused with feeling of zest, and effort with its lack. The fact that a thing is difficult does not of necessity mean that its accomplishment may not be accompanied by a feeling of zest; nor does the fact that a thing is easy of accomplishment mean that a feeling of zest must be present. A wise teacher will not seek to give easy experiences under the impression that in so doing he makes possible, of necessity, a feeling of zest upon the part of the pupils. Neither will he shun assigning difficult tasks, when those tasks are necessary, just because, for the time being, they happen to be lacking in feeling of zest. Thorndike's practical advice: "Get the right things done at any cost, but get them done with as little inhibition and strain as possible" is good for extremists who glory in a soft pedagogy which never asks children to attack difficult problems as well as for those who glory in effort for effort's sake.

Certain muscular habits may be secured without the child's being conscious of what is going on; in the case of mental habits there can be no assimilation without consciousness or attention upon the part of the pupil. This means that the teacher in his attempts to attach a feeling of zest to some remote reaction by associating it with some reaction immediately possessed of a feeling of zest cannot do so without at some time and in some way fixing the pupil's attention upon the remote reaction. The teacher's effort should be not one of concealing the remote reaction desired of the pupil by society, but rather one of getting him to attend to the fixing of the habits of the remote reaction as means, so far as the pupil is concerned at this time, of securing the thing in which the pupil is intrinsically interested. In such a manner, attention may be fixed upon the making of abstract exercises pre-

paratory to application in projects. Projects, however, of a simpler nature must precede this latter experience else the pupil has no basis for developing a feeling of need for the exercise.

Drill is an essential factor in fixing connections. An erroneous conception that drill cannot be accompanied by a feeling of zest is not uncommon. It is possible to so attach duplication of process to reactions natively possessed of a feeling of zest that drill secures values which come thru repetition and thru accompanying feeling of satisfaction. Drill not so accompanied, depending merely upon frequency or repetition, very largely defeats its own ends. Eight joints of a given kind in a taboret a boy wants are better than eight abstract exercises repeated as so much drill.

Logical arrangement of subject-matter and psychological considerations of development of the individual conflict. Good pedagogy seeks to harmonize this conflict by granting society the right to determine what shall be taught but insisting that psychology shall determine how this shall be taught.

Reference Reading:

Thorndike: *Principles of Teaching,* Chapter V.
James: *Talks to Teachers,* Chapters X, XI.
Dewey: *How We Think,* Chapter V.
Allen: *The Instructor, the Man, and the Job,* Chapter XXXVII.

Class Discussion:

1. Differentiate interest from attention, if you can.
2. Enumerate kinds of interest.
3. Differentiate feeling of zest from interest.
4. State the law of association so as to make it applicable to interest.
5. Thorndike says: "Get the right things done at any cost, but get them done with as little inhibition and strain as possible." Observe how this is being done in some class, and try to determine what governed the teacher in determining the right things.
6. List a number of ways of securing interest (feeling of zest) in constructive work, and state the approximate de-

gree of strain you expect to have manifested in securing the result desired.

7. A child makes a sled. Is interest here a means or an end? Explain.
8. Dewey says: "Mental assimilation is a matter of consciousness." Is there any value in having a boy make a taboret to produce tool technic and skill when he seemingly cares nothing about tool technic and skill but only for the finished taboret? Explain.
9. Can you see any place for the abstract exercise in shop or construction work? Justify your answer in view of the fact that interest is the indispensable basis of every method of education.
10. If attention cannot be demanded, how, then, can it be secured?
11. State the law of attention.
12. What effect has a pupil's posture upon his attention? Why?

CHAPTER VII

INDIVIDUAL DIFFERENCES; THE GROUP SYSTEM

1. The Law of Probability. If one were to take a number sufficiently large to exclude serious effects from accidental variations of anything in nature, and classify according to some particular characteristic, the curve plotted to represent such variations would be similar to that of Fig. 12. This

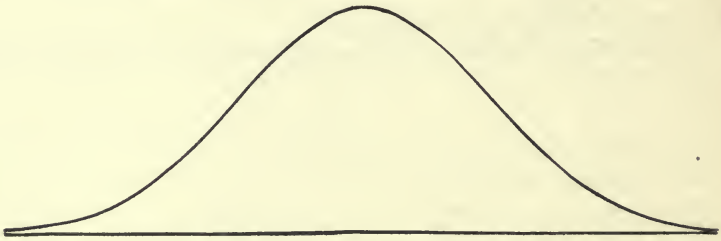


Fig. 12. Probability Curve.

is known as the probability curve and the law, the law of probability. It is also known as the biological law. For example, if we take 1,000 or more people and classify them as to height, we get a distribution such as that of Fig. 13. If we take an equally large number of manual training boys and give them like tasks, then classify them according to the time taken to perform the task we get a similar distribution. In a similar manner we find differences in ability to execute work, in ability to understand proper technic, in interest as to projects to be made, etc., etc. No two people are exactly alike.

2. Practical Significance of Individual Differences. In its largest or group significance individual variations have, to a certain extent, always been recognized in our scheme of

education. We have the various grades in the common and high schools, and special schools for the subnormal and the delinquent, in the larger cities at least. We have recognized

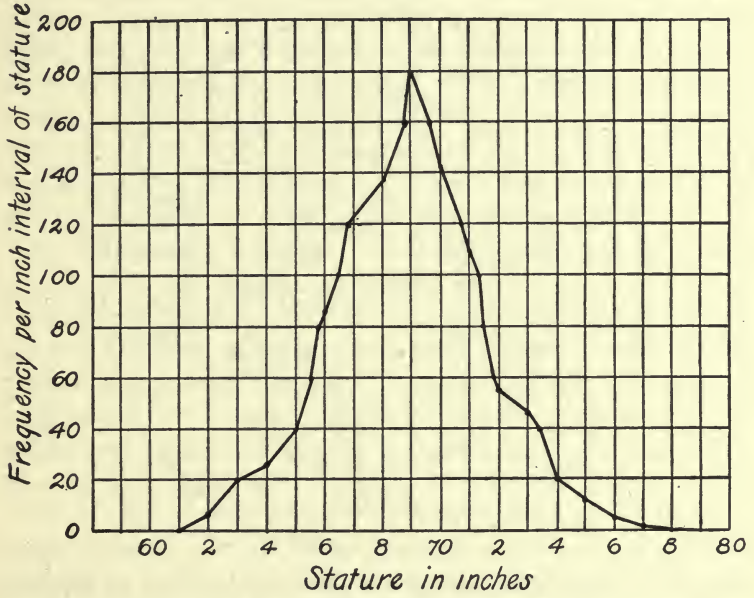


Fig. 13. Frequency-distribution of Stature for 1000 Cambridge Students. From Yule, Theory of Statistics, p. 91.

certain educational needs of common interest, such as arithmetic, reading, writing, citizenship, health, etc. After this, we have differentiated according to larger special activities, as agriculture, manual arts, household arts, etc. Fig. 14, a and b. We have recognized differentiations in schools in types of instruction and types of connection to be made for those going into the professions. Within very recent years we have begun to make provisions in full-time, part-time, and evening schools for those who must early leave school and enter upon vocational activities as compared with those who will

take a college course. Fig. 14, c and d. The problem of this discussion, however, is not concerned so much with these larger differentiations of subject-matter as with the finer

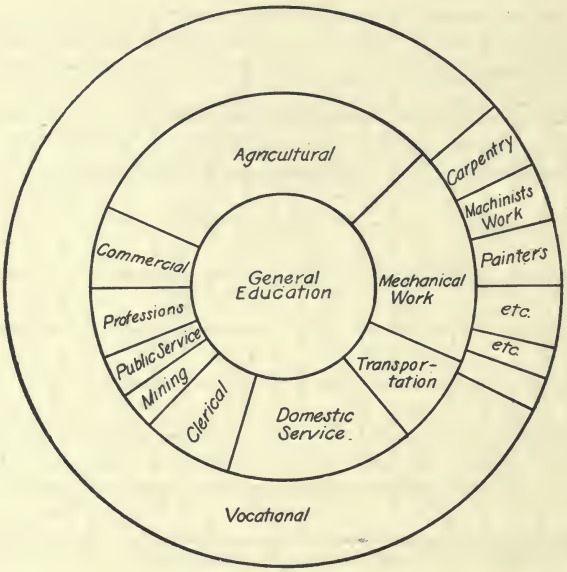


Fig. 14a. Comparative Educational Needs in the State of Missouri. Census 1910.

groupings for teaching purposes within the manual and industrial arts.

Older manual arts teaching practice seemingly tried to ignore facts of individual differences. Courses were organized as tho all children were alike in mental ability, in ability to execute in wood, metal, and other media, in interests, etc. A certain number of exercises were to be made in so many periods; the teacher set the problems, which were the same for all. The young teacher who planned his work in this manner, of course, quickly found himself in a dilemma—fast workers completed the task before the period was up; slow

workers couldn't get thru on time; the superintendent refused to allow the fast workers to be excused before the close of the period, for various reasons. Rather quickly and unpleasantly it dawned upon the young teacher that such differences existed and that some means must be found to provide for them. Had he not been hampered by public school conditions, he might easily have solved the problem by providing a teacher and a course of work to fit the needs of each pupil. Not being able to do this he is driven to see that, while no two individuals are exactly alike, there are enough similarities or likenesses to make possible certain groupings.

3. **The Group System.** The so-called group system of organization and instruction is based upon the fact that, while no two individuals are exactly alike, no two individuals are entirely different, and that similarities are sufficiently numerous to make possible certain groupings among a number of individuals for purposes of subject-matter organization and instruction. Examine Fig. 13 for illustration. The fact that the curve is constantly changing its direction indicates that none of the men measured for height were of exactly the same stature. On the other hand, it will be noted that the interval used as a unit of measurement is the inch. Obviously, with any large number of men examined, not a few will be found to fall within a given measurement such as this.

This inch represents, then, an interval selected here as of sufficient size for purposes of analysis, as is indicated by the curve as plotted. It would have been possible to have taken a smaller interval; it would have been possible to have taken a larger one. To have taken a smaller interval would have been to increase the accuracy with which the curve could have been plotted or the accuracy with which the analysis could have been made. To have increased the interval would have been to have decreased the accuracy of differentiation.

There is, of course, such a thing as having groups or inter-

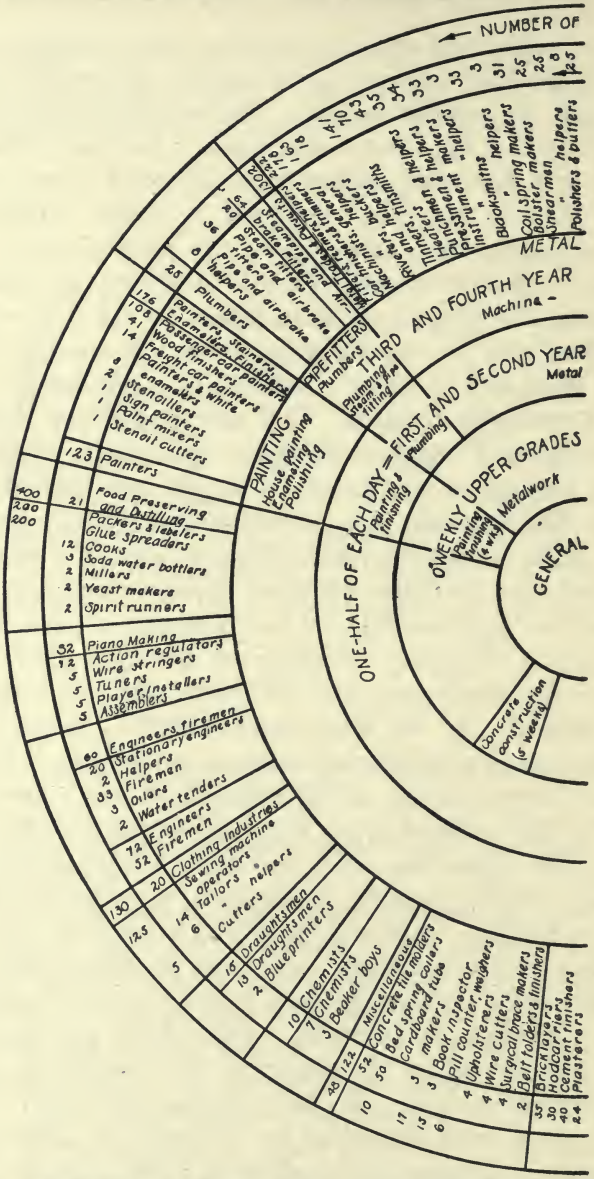
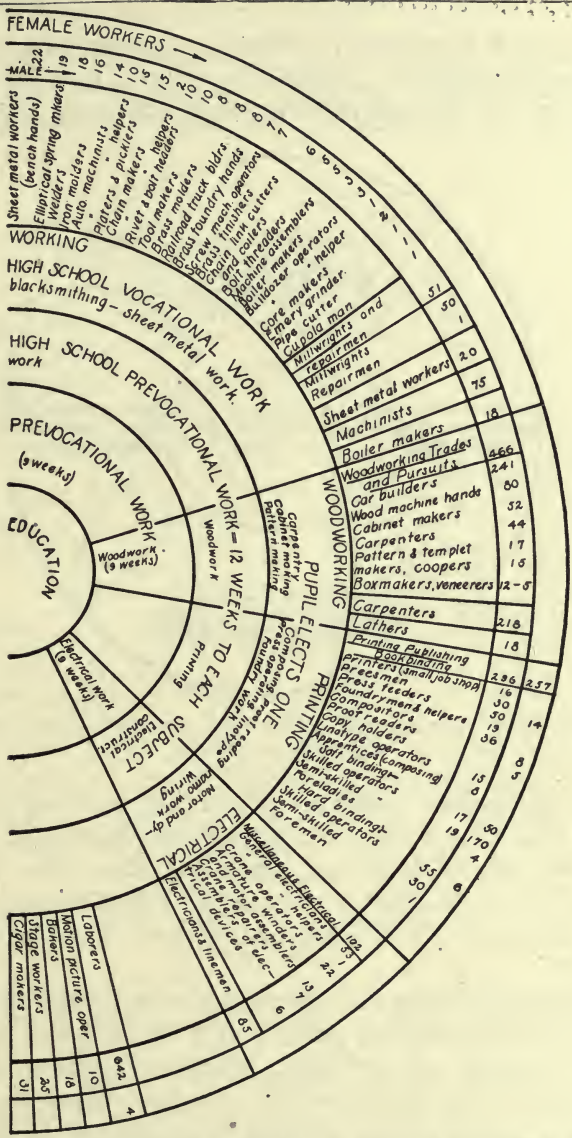


Fig. 14b. Illustrating a Survey and a Plan Suggested for Meeting a ard's "Some Facts Concerning the People, Industries and



Local Community Need in Industrial Arts. Charted from R. J. Leon-Schools of Hammond" (Indiana). Population 20,925 (1910).

vals so small that they are difficult to handle as a means of practical investigation. Again, the interval may be so large as to fail to distinguish individuals one from another in

Fig. 14c. Educational Activities Based upon Vocational Interests or Needs.

groups sufficiently numerous to indicate anything of value. If, in Fig. 13, for example, an interval of eight times one inch had been used, all men then would have classed as one and nothing as to differences could have been told,—no curve could have been plotted. Figs. 12, 15, and 16 can be similarly analyzed.

The essential thing to be derived from a consideration such as that of the preceding paragraph is the fact that wherever there is change and difference, whether in time or in characteristics of one kind or another, the only means we have of making an analysis—of plotting the curve—is to break up

the movement into intervals or groups each based upon some finite unit of measurement. The group system in organization and teaching manual and industrial arts is merely an

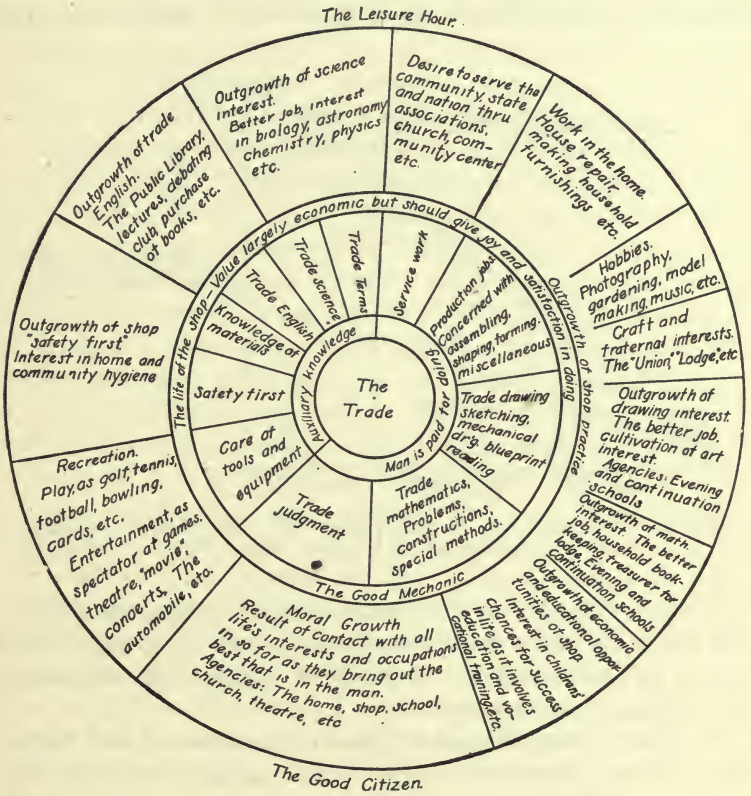


Fig. 14d. The Tradesman and His Opportunities for the Larger Life. By Assistant Professor James McKinney, University of Illinois.

application of this practical device, as old as time itself, by which certain areas, to refer to Fig. 15, may be set off between the base line and the line which represents progress.

Philosophically we make use of the group system in every consideration of a given characteristic of any kind which is dynamic or changing or moving, for, to consider implies to select, and selection is possible only thru grouping. In the discussion which follows, then, it should be remembered that

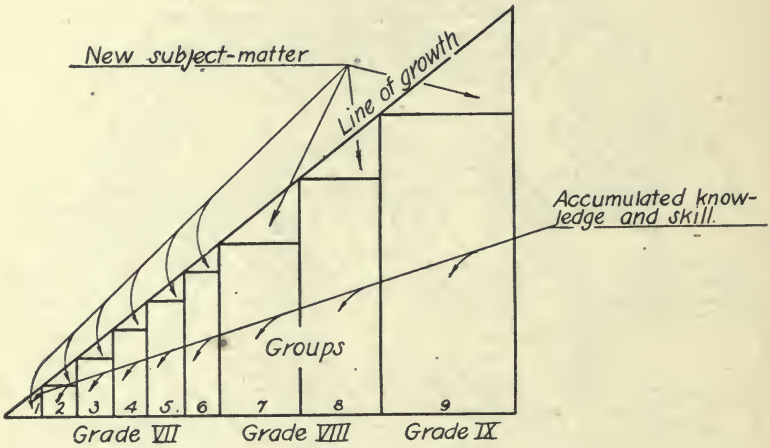


Fig. 15. Accumulation of Knowledge and Skill thru Progressive Grouping of Subject Matter.

it is not a question as to whether we shall group or not group but rather as to the most convenient size of the group we are to use as an interval for purposes of practical considerations of matters of administration.

4. The Group System Applied to the Manual and Industrial Arts. Historically, American manual arts practice has been influenced greatly by two foreign movements—the Russian system of tool instruction and Swedish sloyd. The former was organized by M. Victor Della Vos at Moscow for purposes of better training men for railway shop and engineering work, and was thoroly technical in its aspects. Swedish sloyd arose in response to a demand for a better type of

citizenship. Both systems emphasized orderly introduction of instruction in the use of tools, the former by the use of abstract exercises, the latter mainly thru the use of the useful model. In methods of teaching, the former made use of the class as the unit while the latter gave instruction individually. American practice makes use of both exercise and useful model and the instruction is by class first with this supplemented by individual instruction as necessary.

Examine the type outlines, Griffith: *Correlated Courses*, pp. 12-15; 22-26, Technical Shopwork and Mechanical Drawing, Grades VII-X. It will be seen that the subject-matter here is grouped under certain headings. The work is supposed to be sequential in the main, going from simple to more difficult operations. After the first group there are a number of projects in each group. Each project in a given group is similar to that of every other project in the group. A student upon completing at least one project in each group will have completed the minimum essentials in this course of work.

Now, as to allowances for variations in speed, the class remains working in a group until at least one project has been completed by every boy who is to be considered as passable. This means that the rapid worker, while he gains no more than the slow one in instruction or technic does gain in facility in execution and in opportunity to make more things. Allowance is made for variation in interests in that a boy has freedom in his choice of projects within the group. Still further allowances for variation are made in these type outlines in that the farther a boy progresses the larger the number of projects from which to select. Also, after a fair degree of efficiency and understanding is secured, he is not only permitted but encouraged to modify the projects the better to meet his individual needs, subject only to limitations of the group processes. Should he want to make a project not in the groups, he is expected to abide his time until the group

having the instruction pertaining to the making of that project shall have been reached.

It will have been noted in the examination of the typical outlines referred to above that the farther a student advances in the work the larger is the amount of subject-matter and experience in any given group, Fig. 15. The amount of new subject-matter is not necessarily much greater but the accumulating technical knowledge and skill makes it possible to construct projects which are quite complicated and which require much time for completion. In grade eight any one student will complete not more than three or four projects at the most, together with the accompanying drawings, while in grade seven he will have completed six or seven projects in the same time allotment. In high school the projects are more involved in construction than in the eighth grade.

A question might be raised as to the advisability or desirability of limiting pupils to choice within a group. Only in this way is it possible to care for large numbers, and child nature has, as has been said, more likenesses than differences. Boys of twenty years ago took interest in taborets at a certain stage of development; they still take such an interest. So long as the taboret serves a useful purpose in education better than something else, it should not be eliminated merely for the sake of change. It is possible to select representative projects which will secure interest and at the same time permit orderly instruction in tool processes. It is recognized that such an arrangement is somewhat formal—individuals are not treated wholly as individuals.

In answer to such criticism it may be cited that no man lives to himself alone in society, and that if education is, among other things, a preparation for living, such limitations are helpful rather than harmful. The homely story of the Irish immigrant, brought before the police judge in New York City for assault, illustrates the point at issue. He had

"punched" another man's nose. "Why did you do it, Pat"? asked the judge. "Faith, your Honor"! he replied, "I had always heard in Ireland that America was a land of liberty, and I was just exercising my liberty when this man's nose got in the way." The judge replied, "This *is* a land of liberty, but your liberty ends where the other man's nose begins. You are sentenced thirty days for assault."

Expressional manual arts, central and illustrative, will take its groupings not according to processes but according to projects determined by the subject-matter of the academic work. If, for example, the aim is to develop number and language ideas thru the construction of the doll house, the construction work will be arranged with this thought in mind, the teacher having in mind the academic requirements in number and language work for a given month or week for a given grade. An examination of the type outlines in Appendix II, Expressional Handwork. Grades I-VI, will indicate groupings of expressional manual arts quite suggestive in character.

Industrial arts, like manual arts, will have to be organized for teaching purposes upon a group basis. The present finds a number of different practices in common use. One set of administrators advocates a grouping wholly on the basis of production. Instruction, they say, will care for itself as an incident to production. Others advocate a grouping according to instructional needs, production being an incident. The chief difficulty in grouping here is due to the fact, already mentioned, that the giving of instruction, which has to do with intellect, is opposed to the development of efficiency, which has to do with feeling and skill. Industrial arts must develop efficiency, but efficiency depends upon instruction.

It is not within the province of this text to discuss fully the problem of appropriate grouping of subject-matter. But in general, it may be said that those schools which have differentiated subject-matter and experiences into groups for pur-

poses of instruction on the one hand and of production or efficiency on the other, with rather close alternation, come nearest a proper solution. For an example of a typical grouping for industrial arts purposes, consult Bennett's *The Manual Arts,* pp. 96-99. It will be noted that an instructional group precedes each production or efficiency-producing group. The alternation is so arranged that the student gets a basis for future production work in each new group thru instruction and preliminary exercise. This is superior to the Russian system, for in the Russian system the opportunity for practical application, or the securing of efficiency, came only after a rather extended course in instruction and exercise.

It should be especially noted that production projects are to be selected and so placed in the groups, that they shall provide opportunity for gaining efficiency in the application of the instruction of the preceding group. This implies forethought upon the part of the teacher in selecting his project work to see that experiences are introduced in a reasonable order as to difficultness and to see that all necessary experiences are provided for at some place.

Quite different is this practice from that wherein the institution executes orders for work as such work happens to be needed about the building. If the process is to be really educative it must be "construction for instruction, rather than instruction for construction"; certainly not construction merely for construction's sake. A class might spend two or three years doing repair work about school buildings and still have no adequate preparation for carpentry as a trade. Experiences must be selected and arranged beforehand and not left to chance. If there is to be growth, as there must be if the process is educative, the curve which represents accomplishment must be constantly changing and ever be upward in its general direction. For practical purposes it must change group by group, and growth must be possible thru

not too great steps at any one interval, Fig. 15. If the steps are too great, trouble will be occasioned thru violation of the principle of apperception.

In the industrial arts, the number of students assigned to any one teacher for instruction and oversight is generally much smaller than is the case in manual arts. This makes possible greater differentiation in management. Industrial arts teachers often have such small numbers in a group that the progress of students may be independent one of another, with the instruction individual.

In view of the fact that efficiency is such an important factor in industrial arts, and the further fact that individual instruction is so expensive, there is a question as to whether public schools are justified in differentiations so great as to permit of individual instruction. Rather, the group might better be set for normal time, and normal quantitative and qualitative production requirements, with class instruction at stated intervals. The fast workers gain in efficiency in execution tho they may be held back somewhat thru having to await instruction in new subject-matter because of class organization based upon the slower students' capacity to execute. It must be recognized, of course, that certain types of industrial work lend themselves to class instruction better than others. Availability of duplicate equipment also will qualify groupings as to numbers to be accommodated at any one time. Instruction wherein the student is introduced to dangerous machines, as in a wood shop, will have to be given to smaller groups of students than will instruction in smithing, etc.

5. **Grouping for Classification and Grading.** Since no two individuals are exactly alike the curve which represents any selected characteristic, as has been stated, will constantly vary, Fig. 12. For purposes of convenience we may group individuals as in Fig. 16—2 per cent excellent, 23 per cent

superior, 50 per cent medium, 23 per cent inferior, 2 per cent failure. The so-called average pupil may then be considered as of the 50 per cent medium group. Some institutions even accentuate such differences by an award of 30 per cent excess credit to the 2 per cent E, 15 per cent excess to the 23 per cent S, with a diminished credit of 15 per cent from the I. F,

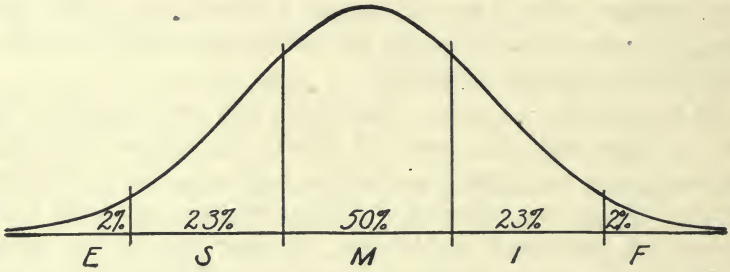


Fig. 16. A Given Characteristic Arbitrarily Distributed for Convenience in Classification.

ordinarily, does not represent the mentally or physically subnormal or defective. These are not supposed to be allowed in a normal group, but rather F stands for those who have ability but who do not apply themselves to the task assigned as they should to meet the essentials set for that particular group.

Larger or smaller intervals might have been selected, of course, but for practical purposes those suggested will be found convenient and sufficiently limiting in scope. Any teacher of extended experience knows how profitless is the time spent in trying to estimate pupils or to group them in smaller intervals. Those teachers who mark pupils in terms of percents or half percents unnecessarily burden themselves, if they are doing their work conscientiously. The chief purpose of grading is that of rewarding good work, and pupils find rewards that are distributed as mentioned equally as

stimulating as where the teacher seeks to refine the intervals to fractional percents. Some instructors grade simply as "passed" or "not passed." Experience seems to show that such a large unit is not sufficiently discriminating as a reward to get all pupils to do their best, many strong students being satisfied to do merely passing work who otherwise would do superior or excellent.

There will be occasion to refer to this section in the discussion of standards and tests, Chapter XIV.

6. Grouping for Developing Initiative. Mention has been made of the fact that, once a fair degree of understanding and skill has been developed in technical manual arts, a pupil is to be encouraged to modify designs in a group to meet his individual needs. Also, that he is to be encouraged to design his own projects, subject only to awaiting the time they can be constructed with projects of similar processes. In addition to this, it seems advisable to set aside an occasional group where attention can be centered upon individual initiative. Such groups may be limited to the extent the projects designed shall have no technical requirements other than what have been taught in previous groups.

7. Summary. If one were to take a number sufficiently large to exclude serious effects from accidental variations of anything in nature and classify according to some particular characteristic, the resulting numerical distribution would make evident the fact that no two are exactly alike. If the results were to be plotted in the form of a graph, the curve would offer visual proof of such variations. The law by which these distributions are controlled is known as the law of probability.

In its largest significance individual variations have, to a certain extent, always been recognized in our scheme of education. The problem of this discussion is concerned not so much with these larger differentiations of subject-matter

needs as with the finer groupings within the manual and industrial arts for teaching purposes.

The so called group system of organization and instruction is based upon the fact that, while no two individuals are exactly alike, no two are entirely unlike, and that similarities are sufficiently numerous to make possible certain groupings among a number of individuals for purposes of organization and instruction. The essential thing to be derived from a consideration of the group system is the fact that wherever there is change or difference the only means we have of making analyses is to break up the movement into convenient intervals or groups, each based upon some finite unit of measurement. The group system in manual and industrial arts is merely an application of this practical device, as old as time itself. In the discussion, the question is not one of grouping or not grouping, but rather as to the most convenient size of the group for purposes of practical consideration of matters of administration and instruction.

Historically, American manual arts practice has been greatly influenced by two foreign movements—the Russian system of tool instruction and Swedish sloyd. Both systems emphasized orderly introduction of tool instruction, one thru the use of exercises and the other thru the useful model. The former made use of class instruction, in the latter the instruction was individual. American practice makes use of both exercise and useful model. The instruction is by class first, and this supplemented by individual attention as necessary.

For purposes of convenience in classification for rewards thru grading, we may group individuals as 2 per cent excellent, 23 per cent superior, 50 per cent medium, 23 per cent inferior, 2 per cent failure. Larger or smaller intervals might have been selected; for practical purposes those selected are convenient, easy of administration, and sufficiently limiting to serve the purpose.

Certain groups should be set aside in technical manual arts wherein the student may be given opportunity to exercise initiative. At first, such attempts should be limited to the application to new projects of information obtained thru past instruction. Whether such groups shall be set aside in industrial arts depends upon the aim of the course. Any course which is intended to develop leadership and its responsibilities should certainly provide such group opportunities.

Reading References:

Thorndike: *Principles of Teaching,* Chapters VI, VII.
Bennett: *The Manual Arts,* Chapters VI, VII.
Allen: *The Instructor, the Man and the Job,* Chapters V-VIII.
Griffith: *Correlated Courses,* pp. 10-28.

Class Discussion:

1. Judging from the graphs on pages 71, 72, 75 of Thorndike's *Principles of Teaching,* what conclusion do you draw as to the advisability of attempting to secure a like amount of work or the same degree of technic and skill from all the pupils?
2. What is your opinion of an arrangement for purposes of classification—2 to 5 per cent, excellent; 20 per cent, superior; 50 per cent, medium; 20 per cent, inferior; 2 to 5 per cent, failure?
3. Explain in what manner Thorndike's graphs seem to justify such classification.
4. What is your understanding of the term, average pupil?
5. What is your opinion as to the advisability of giving excess and diminished credit—30 per cent excess for E; 15 per cent for S; 15 per cent diminished credit for I.
6. Does F stand for defective or subnormal in the above scheme?
7. If "every stimulus must be given not to children in general, but to a particular individual or group characterized by certain peculiarities", what of class teaching?
8. Granted sufficient teaching force or staff, is individual instruction better than instruction to a reasonable number possessing like peculiarities? Discuss.
9. In public schools, individual instruction is hardly possible irrespective of any considerations of desirability. State

definitely just how you expect to make allowances for variation on the part of your pupils in the matter of interest, execution or skill, and technic or form.

10. How do you expect to develop initiative and at the same time teach the pupils the conventional ways of manipulating the material to be worked on?

CHAPTER VIII

CORRELATION AND ASSOCIATION

1. Correlation. No other topic has appeared so frequently upon the programs of the drawing and manual training associations in the United States as that of correlation. To correlate or not to correlate seems to be an ever present topic for discussion. Shall manual training shopwork and design be correlated? Shall shopwork and mechanical drawing be correlated? Shall machine drawing and machine shop work be correlated? Shall shopwork or drawing and academic subjects, such as arithmetic and English, etc., be correlated? Some teachers frankly oppose correlation; some favor correlation provided their special subject becomes the center or core about which the correlations are to be made. Others recognize correlation as highly desirable but believe such a conflict exists in any attempt at correlation that each special subject must go its own way.

Correlation is the native state of mind of children. Referring to Professor James' famous phrase, it is out of a big, blooming, buzzing confusion that consciousness arises as a result of a differentiation of elements which go to make up this confusion. This analogy serves well to indicate both the strength and the weakness of correlation as an educational principle. If consciousness is a development out of oneness —out of a "big, blooming, buzzing, confusion" thru differentiations, it may readily be inferred that little children are to be taught thru closely correlated subject-matter—not arithmetic as arithmetic, not handwork as handwork, but all a part of one unified experience. As they grow older, differentiations may well be emphasized until we have arithmetic, language, science, manual training, etc.—each as a subject in itself.

2. **Correlation Another Name for Association.** Correlation is but another name for association and what has been said of association and the law of association applies equally to correlation. If we would be assured that certain connections, as that the facts of mechanical drawing will be utilized in connection with the wood shop problems, we must see that such connections are made with frequency, recency, intensity and resulting satisfaction. The more specific and direct the connections or the correlation, the more certain are we that such connections will be made again under similar circumstances. The more general the instruction and the wider the possibilities for application, the weaker are the connections likely to be.

3. **Two Types of Correlation.** For the sake of convenience we may speak of correlations as of two types—immediate and remote or direct and indirect. For example, a class of fourth grade children may be taken to a blacksmith shop. They may watch the men at work; question as directed as to tools, processes, etc., etc. Upon returning to the school they may write up their experiences in the form of very definite lessons both in language and in number work. They may make drawings to illustrate parts in their lessons—drawings of the anvil with the names of the parts properly placed thereon, etc. They may make booklet covers to hold these and similar lessons, decorating the cover page. This might well be considered a correlation between elementary handwork and design, language and number work, and blacksmithing. Blacksmithing, however, will not be taught that class until second year high school, and then to the boys only. Nevertheless, we may justly call even blacksmithing a correlation—a remote correlation or, as Dr. Judd calls it, a correlation in the mind of the child rather than a correlation of time.

An example of immediate or direct correlation will be found in the outlines for woodwork and mechanical drawing.

Griffith, *Correlated Courses,* pp. 22-26. An attempt has been made here to make the mechanical drawing serve the woodwork thru having the principles of mechanical drawing taught in the making of drawings for the woodwork. The

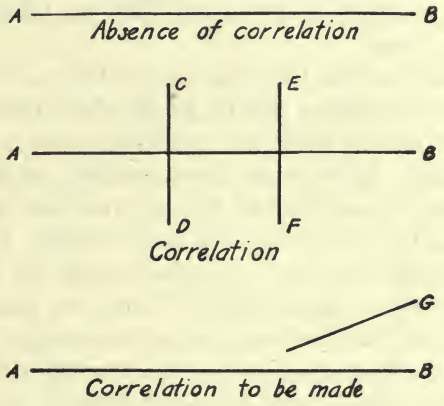


Fig. 17.

woodwork in turn serves the drawing thru motivating it, that is, giving the boys a feeling of real need for the drawing experience.

4. Advantages and Limitations of Immediate Correlations. Certain advantages and disadvantages which accrue thru the correlating of one subject with another or one activity with another may be illustrated by a diagram such as that of Fig. 17. If a journey is to be made from A to B a traveler will experience little uncertainty and delay upon a road which has no intersecting roads. If there should be an intersecting road from C to D, he may have to stop and inquire at the cross-road which road to take to go to B. Let him come to another intersection like that at E-F, and again he hesitates—the greater the number of intersections or con-

nections the more time will he lose in stopping to determine the right road. So in correlations, the more widely we relate an idea or an act, the less efficient is any one connection, which otherwise can find expression in one direction only. We increase the cross-roads, as it were, and these tend to hold up the traveler as he is not held up when he can go only straight ahead.

From considerations like this we might conclude that correlations or associations are to be avoided; that educational ends are best served when we specialize—take a direct route to a specific end. If we wish, for example, to teach percentage to a carpenter, let us teach it not as principles of percentage with its by-paths or cross-roads into banking business, into sheet-metal trade, etc., etc. In other words, let us take path A-B which has no cross-roads. Now, so long as one so taught continues to travel the road of percentage in carpentry, well and good—this direct method is most efficient. However, suppose such an one should be called upon to travel not from A to B but from A to G, and no cross-roads are present, Fig. 17. According to the law of association he will not know how or where to get off the road A-B, except by trial and error. As Professor James would say, he is non-plussed.

Fig. 18 further illustrates the advantages and disadvantages of correlation. Correlation may be likened to a city having many connecting roads leading into it. A cross-country automobilist will find it easy to get into such a city. When he attempts to get out, however, he finds more confusion than he would have found had there been but one road.

5. Conflicting Aims. From what has been said it may readily be seen that generalized and specialized training are but one aspect of the problem of correlation or lack of correlation and that the aims conflict. The stream of consciousness is of a given volume. When we spread it out thru many connections or correlations, we necessarily make it shallow;

when we deepen it thru specialization and the elimination of connections we necessarily make it narrow. Shallow minded people are equally as unfortunate as are narrow minded peo-

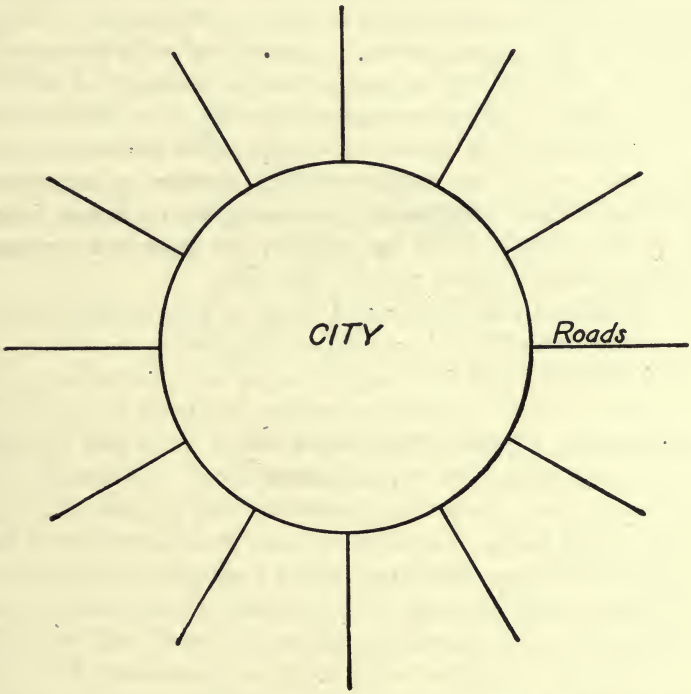


Fig. 18. Illustrating Advantage and Disadvantage of Correlation.

ple, and vice versa. A person who can do everything usually can do no one thing well. On the other hand, a person who is narrowly trained may be called upon to meet life along some other line of endeavor; he is then non-plussed. The problem is one of those educational problems which do not admit of an ideal solution. In general education we must spread out to a certain extent for we want to produce a type

of individual capable of meeting a number of situations fairly well. After these minimal essentials of breadth have been obtained, we ought to separate pupils into groups for purposes of specialization, narrowing and deepening their connections within the special group. By refering to Fig. 14 a, b, c and d we get a good notion of the educational problem as it has to do with generalized subject-matter and special subject-matter. These charts may represent the life of an individual as it has to do with his formal education. The problem is to a very large extent an administrative problem as well as a psychological and pedagogical problem. We do not and cannot in our schools teach individuals, we must teach groups with like characteristics and like life aims.

6. Practical Difficulties and Aids in Correlation. Chief among the difficulties of correlating subject-matter which has become differentiated into subjects is the fact that what may be a sequence in one is not necessarily a sequence in the other. For example, a certain high school wood shop and drafting department decided to correlate their work. It was decided that the drafting room should make up the working drawings for the wood shop. The first problem in the wood shop was a piece of furniture—the boys had had grammar school woodwork and pencil drawing. This proved a satisfactory shop problem but as a drafting problem for first work in inking it was entirely too difficult. Usually, in such cases, it is possible to make a correlation by slight modification of procedure in the drafting room. Pupils may be given preliminary inking problems of a simpler kind. The outlines for woodwork and mechanical drawing, *Correlated Courses,* are correlated in this way. Certain exercise problems in drawing are utilized to bridge such gaps and thus permit each of the correlated subjects to have a logical sequence of its own. Again, in another school mechanical drawing, as to development and intersections, was taught wholly as abstract or unrelated

material in the freshman year. In the sophomore year in sheet metal, applications of these same principles occurred. Not a few boys failed to see any relation between the freshman drawing and the sheet metal application and had to be taught the application as new matter. A wise teacher of drawing will take time to make such connections in the minds of the boys by pointing out such applications and by the introduction of not a few sheet metal drafting problems as a part of the work in drawing.

7. Summary. Correlation is the native state of mind of little children and they must be taught in terms of closely related subject-matter and experiences. As they grow older differentiations are to be emphasized until we have arithmetic, language, construction work, etc.—each with subject-matter of its own, with a right to its own organization in the main.

Correlation is but another name for association and what has been said of association and the law of association applies with equal force to correlation.

For the sake of convenience, we may speak of correlations as of two kinds or types—immediate and remote. In remote correlations the connections are made in the mind of the child rather than in time. In immediate correlations the desired connections are accomplished in time as well as in the mind.

Certain advantages accrue thru the correlation of one subject with another; also certain disadvantages. The problem of generalized versus specialized training is but one aspect of the problem of correlation or association. It is one of those educational problems which do not admit of an ideal solution. The best that can be done is to lay as broad a foundation thru correlations and associations as time and economic conditions will permit, and then upon this to erect a specialized structure made so by eliminating all correlations

or associations or interests which do not lend themselves to the purpose in hand.

Chief among the practical difficulties which interfere with close correlation of one educational subject with another is the fact that sequence in one rarely corresponds with sequence in another. Frequently, however, a thoroly satisfactory correlation can be made if each instructor will make certain adjustments in the sequence of his subject-matter to accommodate that of the other.

Reference Reading:

Thorndike: *Principles of Teaching,* Chapter VIII.
James: *Talks to Teachers,* Chapters VIII, IX, XII.

Class Discussion:

1. State the law of association as it applies to impressions; to memory; to habits involving muscular reactions.
2. From observations made, enumerate evident regard for the law of association in some manual arts teaching.
3. Describe any evident violation of the law if you have seen such and suggest a remedy.
4. Concentration, repetition, and recall are means used to fix connections. State how the teacher observed was securing these.
5. Why have a child build a piece of woodwork which interests him rather than one which does not?
6. Which is better pedagogically, a taboret with eight joints of the same kind or a joint disconnected from any object of interest repeated eight times, where the acquiring of proper technic and skill are the aims of the teacher. Would you modify your answer were one of the following specified: in lower grades, in upper grades, in high school, in university?
7. Why have recitations upon assigned reading bearing upon the work being done in the shop?
8. What is gained and what lost, if anything, by having mechanical drawings precede the making of projects?
9. When manual arts is given as a means of teaching other subjects as history, etc, what is gained and what is lost?
10. Practically all teachers believe in correlation—correlation of other subjects with their own. It is said that every subject has a right to organization as a subject in itself;

what do you conclude as to the possibility of correlation if this is true?

11. As manual arts teachers, what attitude do you expect to take in the matter of correlating your subject with other subjects?
12. Give an example of correlation in manual arts; in the industrial arts.

CHAPTER IX

THE DOCTRINE OF DISCIPLINE

1. The Problem of Discipline Stated. Whether the old conception of the mind as a bundle of faculties, each working independently of the experiences with which it deals, was merely a convenient academic solution of the impossible problem of any one mind's encompassing all knowledge, or whether the theorist evolved the faculty psychology first, and pedagogy made use of it because of its convenience, is a matter of small moment. What is of importance to the teacher of manual and industrial arts in this connection is that he have a clear conception of the problem of discipline as an educational means or an end.

Since the time of Locke, educational practice has in the main justified itself upon the ground of discipline, the older view being that it mattered not what the subject-matter might be, discipline of mind in one thing necessarily meant discipline of mind in other things. For example, the study of Latin was supposed to strengthen the memory so that a good Latin student would be of necessity a better salesman of codfish in which a memory of faces is involved. Attending church twice on Sunday was thought to be a discipline which would carry over on Monday and make a man honest in his business, even as he was honest on Sunday in his church service. Making boys accurate and neat in manual training was to make boys accurate and neat in personal matters, etc., etc.

From what has been said in Chapter VIII about the difficulties confronting education in its efforts to correlate or encompass all knowledge and all useful habits of muscle and mind, and at the same time differentiate and specialize so that each thing considered might be worth while, such a doctrine of transference of habits of mind and muscle, irrespective

of associations or connections, provided a happy solution. According to this doctrine it mattered little what was taught in school provided it was taught so as to develop some faculty of the mind, as memory, will, etc. Even manual training in its earlier days was guaranteed to make a boy honest, accurate, neat, etc., in all things, irrespective of connections, once a boy passed thru these experiences in his manual training. A boy made neat in his woodwork was supposed of necessity to become neat in his personal appearance, etc., etc.

Unfortunately for the peace of mind of those who think, psychological and pedagogical investigations and experiments failed to sustain any such doctrine in its entirety.

2. **Early Revised View.** Upon investigation and experimentation it was thought that the development of habits of memory, will, honesty, accuracy, skill, etc., in any one direction was but slight guarantee that such habits would be found in other directions. The conclusion was drawn by certain experimentors that general training was an impossible thing and that only specific end was of any value. Even if we thought we were training the memory thru Latin, in fact we were only training it in ability to remember Latin. That if we wished to develop memory in any other line we could do so only by dealing specifically with that particular line.

Naturally, this view presented a difficult problem to the teacher. A limited time for the education of a youth, a world wide racial knowledge and experience with which to acquaint him, and then to be informed that only as each pupil was habituated to each highly differentiated experience, was that experience of value! If a boy was to form habits of honesty, accuracy, or neatness, he could not be expected to do so except as he was taught such habits in each and every line of endeavor. If a child was to be taught arithmetic, it would have to be arithmetic of the baker, the broker, or the seamstress. There could be no general education.

If the older view of habit transference without connections was false, and it is so recognized, the newer view led to some extreme generalizations or implications in the opposite direction. Common observations are sufficient to indicate that certain habits seem to function in subject-matter and method greatly different from that with which these habits originally were formed. A boy who has had a good course in woodwork generally does better work the next semester when he takes up forging, altho the subject-matter is quite different. A boy who has had a good course in forging the first semester does better work in woodwork the second semester An engineering upper classman or graduate, as a general thing, keeps a neater note-book than upper classmen in other schools not demanding painstaking care in note-book work, etc.

3. The Present View of Generalized and Specialized Training. It is generally recognized today that while there is no such thing as a generalized habit, specialized habits of mind and muscle are so intricately interwoven in their connections that oftentimes it is difficult to detect any connections. It is out of this inability that the doctrine of generalized habits has grown.

The law of association should give us the explanation of, or the answer to, the question of transference of habit. The likelihood that one thought or act will call up another thought or act is in proportion to the frequency, recency, intensity and resulting satisfaction of previous connection, other things being equal. No connection, then no likelihood of recall. An examination of any real or seeming transference of habit will show that such connections are due to:

1. Similarity of subject-matter of specific experiences.
2. Similarity of method of procedure.
3. The extent to which such experiences have been made to take the form of ideals, or of rules, or of principles which serve as connecting links.

The boy who has had woodwork the first semester is better prepared to do metalwork the second semester, among other things, because habits of exact measurement in woodwork and metalwork are not unlike—similarity of method of procedure. Again, a boy who has had woodwork, among other things, has formed a habit, probably, of systematic methods of attack in woodwork, which habit has been dissociated from woodwork and made to take the form of an ideal—not systematic method of procedure a desirable thing in woodwork alone, but system a desirable thing always.

A boy who is given habits of neatness, accuracy or honesty in the making of a bird house is that much better for the experience. School time, however, is too short to teach neatness, accuracy, honesty, in the one thousand and one things in which the elements are necessary. While "empirical concretes," the specific experiences, "and not abstractions give the basis for association" (Judd), it will readily appear that attention, devoted to associations wholly within that experience and no attempt made to connect certain elements, dissociated thru abstractions, with other situations is a short sighted policy. That is, the correct way to teach neatness, accuracy, honesty, etc., is to teach them, for example, as necessary factors in making a sled, a taboret, etc. However, this should not be the sole end of education so far as these elements are concerned. After a boy has had a number of such experiences, it should be the aim of good teaching to get him to dissociate or abstract these elements and hold them in mind as things always to be desired in all situations. This abstracting process approximates pretty closely the old idea of generalized training—the essential difference, however, lies in the fact that only as such associations are made between empirical concretes and ideals and between these ideals and specific application is it possible to have a so-called transfer.

If by discipline we mean this possible connecting up of one

thing, idea, or experience to another thing, idea, or experience by means of ideals and principles, then discipline is not only possible but is the main justification for most of our particulars of subject-matter in general education. For example, woodwork is a very common requirement in seventh and eighth grades in nearly all progressive schools. Why woodwork, in preference to any other kind of industrial activity? Certainly, only a few boys out of any class are to become workers in wood. For these few, of course, similarity of subject-matter is an essential argument for this particular experience. Rather do we judge the highly specific experience, such as cabinet making or the still broader experience —woodwork—upon the ground of discipline as just interpreted. When we think of this experience not as woodwork but as industrial experience as differentiated from the professional, the agricultural, etc., then similarity of subject-matter and similarity of method procedure enter in as very essential arguments in justification.

4. **Effect of Present View of Discipline Upon Subject-Matter and Method—Logical Basis.** A discussion of the basis of subject-matter belongs primarily to organization of manual arts rather than to teaching manual arts. It seems advisable, however, in view of the discussion just preceding, to indicate briefly such basis, especially since such bases are pre-supposed in all of the type form lessons referred to in this book. First, since expressional or illustrative manual arts is a matter of assisting in the clarification of ideas of other subject-matter, as geography, history, etc., it can hardly be said to have subject-matter of its own. Certainly, its organization will be subordinated to that of subjects it seeks to serve. Examine the suggested outlines for expressional and illustrative manual arts, Appendix II. With technical manual arts and industrial arts, however, the situation is different. Technical manual arts and industrial arts, being ends in them-

selves, more essentially, have a right to sequential organization of subject-matter peculiarly their own.

The selection of subject-matter and method of procedure in technical manual arts and industrial arts will be governed by

1. The extent of similarity which will exist between such subject-matter selected for school purposes, and subject-matter the pupil will deal with after leaving school.
2. The extent of similarity which will exist between method of procedure in such subject-matter selected for school purposes and methods of procedure in subject-matter pupils will deal with after leaving school.
3. The extent to which such subject-matter can be generalized—put into the form of principles, or made to take the form of a science. The extent to which specific attitudes, or attitudes formed in connection with specific experiences, can be made to dissociate themselves and take the form of ideals.

Education in general should begin as at the center of Fig 14-a or 14-b working outward as the development of the child's nature permits.

Where children leave school at an early age and enter upon trade or industrial work, Fig 14-c and d chart educational connections which should be made available. To do less is to lay our boasted public school system open to the charge of inequality of opportunity for acquiring an education.

5. Modification of Choice of Subject-matter Due to Child Nature—Psychological Basis. If society determines *what* shall be taught, child nature must determine how and when it shall be taught. Children are not born logically minded and any logical arrangement of subject-matter and method must accommodate itself in its beginnings to child nature. Boys of high school age are intensely interested in wood-turning; there is little place in the work of the world for wood-turners. Manual training men, a few years ago,

decided to throw out wood-turning for this latter reason. It is highly probable that wood-turning can justify itself on grounds of creating an attitude of interest and joy in work with machines that will make it well worth while, even tho

Fig. 19. Training Room for Apprentices, Lakeside Press, Chicago.

few boys ever can become professional wood-turners. The same thing is true of furniture construction.

Again, similarity of subject-matter and similarity of method of procedure must accommodate themselves to an organization suited to the impartation of new ideas and new experiences. Were experiences in school to be made identical in subject-matter and method to those of the real world, there would be no need for schools. Instead of reproducing the entire real world condition in any one industry, such as carpentry or cabinet making, certain typical processes and blocks of subject-matter will be selected and utilized in so far as they lend themselves to progressive learning and doing. A complete vocational educational experience, will, of course,

involve experience under actual vocational conditions, following or accompanying such training or instructional blocks of experiences. For example, large printing houses have every facility for training boys to become printers thru placing them

Fig. 20. Training Room for Apprentices, Lakeside Press, Chicago.

in press-rooms and composing rooms where real life conditions obtain. They do place them there one-half time but not primarily for instructional purposes. The instruction of these boys is given in an especially fitted room having equipment for printing at one end and school desks at the other end, Figs. 19 and 20. Likewise, large manufacturing plants differentiate instruction from production, Figs. 21 and 22, giving part time to instruction and part to production.

In the smaller communities where limited numbers make a modified form of organization for instruction necessary, or in larger communities where trades and industry are of such

a character that group instruction is not possible or advisable, instruction will have to be individual and on the job. The principles of organization and classification of teachable content and its arrangement for effective instruction will not differ. Certain related work, such as mathematics, drawing,

Fig. 21. Shop Apprentices in Class of Mechanical Drawing, Schenectady Works. Courtesy of General Electric Co., Schenectady, N. Y.

science not infrequently may still be given in classes thru part-time instruction even where the manipulative processes must be taught on the job thru the instructional foreman.

6. Summary. Whatever may have been the origin of the doctrine of discipline, it is important that the teacher of manual and industrial arts have a clear conception of the problem of discipline as an educational means or as an end. Since the time of Locke, educational practice has in the main justified itself upon the ground of discipline, the older view

being that it mattered not what the subject might be, discipline of mind in one thing necessarily meant discipline of mind in other things. In view of the difficulties confronting education in its efforts to correlate or encompass all knowledge and all useful habits, and at the same time differ-

Fig. 22. Training Room for Machinist Apprentices, First Year. Courtesy of General Electric Co., Schenectady, N. Y.

entiate and specialize so that each thing considered might be worth while, such a doctrine of transference of habits, irrespective of connections or associations, provided a happy solution. Unfortunately, psychological and pedagogical experiences failed to sustain any such doctrine in its entirety.

Investigation and experimentation failed to sustain the original belief and out of this arose a belief that only specific training or training toward a highly specific end was of any value. This new view presented a difficult problem to the

teacher, especially in general education where he did not know the specific future of any of his pupils. If the older view claimed too much for itself, the newer view led some to extreme generalizations in the opposite direction.

It is generally conceded that there is no such thing as a generalized habit in the sense that training in one activity will carry over into another wholly unrelated activity. On the other hand, specialized habits are so intricately interwoven that it is often difficult to detect any connections. Out of this inability has come the doctrine of transference without connections. The law of association provides the answer to the question as to transference. No connections, then no transference. Such connections may be made thru similarity of subject-matter, similarity of method of procedure, thru generalization or idealization. Connections of the third type are so very economical of time that education of the past has confined its attention to this type very largely. It is to this type the psychologist of today, who advocates transference, refers. "Transference takes place whenever generalization is reached." (Judd.) If by transference we mean this possible connecting up of one idea or experience with another idea or experience thru generalization or idealization, then discipline is not only possible but is the main justification for most of the particulars of subject-matter in general education.

The selection of subject-matter of technical manual arts and industrial arts will be governed, as is all other subject-matter and method, by similarity of subject-matter, similarity of method of procedure of school experiences to that of probable future life experiences, and extent of generalization and idealization possible. Education in general, then, will begin with such subject-matter as is common to all activities, gradually differentiating into special lines to meet special needs.

The above basis for choice of subject-matter is social, economic, and logical. Children, however, are not born logically

minded, and any logical arrangement of subject-matter and method will have to accommodate itself in its beginnings to child nature. Also, considerations of similarity of subject-matter and similarity of methods of procedure must accommodate themselves to an organization suited to the impartation of new ideas and new experiences—in other words, to considerations of instruction.

Reference Reading:

Thorndike: *Principles of Teaching,* Chapter XV.
Judd: *Psychology of High School Subjects,* Chapter XVII.
Bennett: *The Manual Arts,* Chapter V.
Colvin: *The Learning Process,* Chapters XIV-XVI.

Class Discussion:

1. What is meant when a subject is said to be justified as a part of the course of study on account of its disciplinary value?
2. What is the view of those who uphold what is known as the doctrine of formal discipline?
3. Have you in your reading ever observed any argument for manual arts seemingly based upon this doctrine?
4. Under what conditions may improvement in one special power assist in the improvement of another or others?
5. If "mental capacity is highly specialized", upon what grounds do you justify a course of study which requires all boys of seventh and eighth grades to take woodwork in a city school system?
6. Consulting the chart, Fig. 14b, would you say that a city would do better by its boys if it were to offer subjects other than woodwork, such as metalwork, printing, agriculture, etc.?
7. In a small city, where the necessary money cannot be provided for these various options and only woodwork can be provided, upon what grounds can you justify woodwork for all boys?
8. Will teaching a boy accuracy, neatness, truthfulness, etc., in the making of a sled cause him to be more accurate, neater, and more truthful in other matters? If an affirmative answer is given, explain the conditions under which the transfer is brought about and the relative likelihood of transfer or amount of transfer.
9. Consulting the charts, Fig. 14 a, b, c and d, again, explain how you would justify: 1. General Education. 2. Manual Arts. 3. Highly Specialized or Vocational Education.

CHAPTER X

TYPES OF THINKING INHERENT IN THE MANUAL AND INDUSTRIAL ARTS

1. Introduction. Psychologists have differentiated thinking into two types—associative and selective. Authors of pedagogical literature have been content to accept this differentiation with the result that two distinct schools of thought as to educational method and practice have arisen. The first is composed of men who seek to stress the development of initiative, originality, and a resourceful attitude in pupils, minimizing authority and benefits which accrue from race experience. The second is composed of men who stress authority and race experience and make little effort to develop initiative and originality. A rather voluminous literature has been the result of the controversy carried on by members of these two schools of thought. Much of this literature consists of rather vigorous criticism of the other's point of view. Manual arts and industrial arts methods, and the theory upon which the methods have been based, have had no small amount of such criticism. In order to properly evaluate such methods, which methods are presented in the chapter following, effort will be made in this chapter to evaluate the types of thinking which are common and which furnish the basis for theory as to method and aims.

The educative process is concerned chiefly with associative thinking and with selective thinking of certain well-defined types. One who has followed the discussions which have taken place between these two schools of thought is impressed with the fact that much of the misunderstanding and lack of respect for each other's view is due to the assumption of extreme positions. If, instead of making use of an evaluating unit or interval which divides the subject into two parts,

we were to take a smaller unit, one that would give us three parts, Fig. 23, we should find it easier to analyze and orient our positions with greater success. In no case is an experience one of associative thinking solely, or of selective thinking solely. In every case of associative thinking there is some selective thinking and in every case of selective thinking there must be associative thinking; it is a question of degree. For this reason we are at liberty to select any unit or interval of measurement we may deem advisable.

2. Three Types of Thinking. Instead of discussing the traditional two types, associative and selective, let us consider what we may call common associative, select-associative, and selective. The term select-associative has been introduced as a means of designating a type of thinking which is more selective than common associative and more dependent upon association than is selective. It is a type of thinking of great importance to the technical manual and industrial arts.

Common associative thinking is that kind of thinking which finds expression when two women with nothing in particular to do meet and carry on conversation over the back-yard fence, that kind of thinking which finds expression when men meet about the fire in the village store with nothing in particular to do but pass the time away. Such thinking is "more or less rambling, with no central idea—a mass of detail related in time rather than in reason." It is as if one were to sit by the side of a stream watching the various forms of floating materials pass by without any attempt ever to arrest any of them for a useful purpose of some kind or another. Suppose, however, that one were a fisherman, whose comfort in winter depended upon his getting from those passing floating materials his winter supply of wood. As the various materials pass by, he does not idly let them all pass but selects therefrom those which best serve his purpose. This latter typifies what takes place in selective thinking or reasoning. As the stream of

consciousness flows on thru common associations, the mind, as it were, selects therefrom those things which serve the purpose under consideration. The fisherman does not determine *what* shall pass by; neither does the mind determine what thoughts or ideas shall pass by in the stream of con-

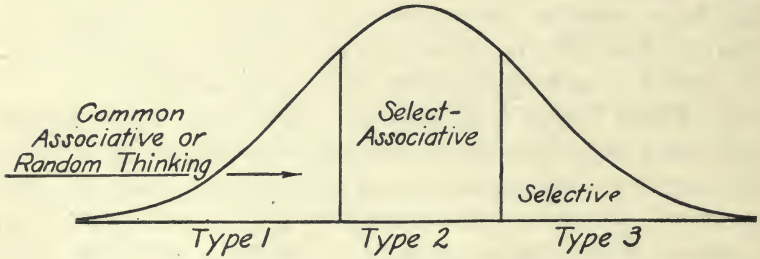


Fig. 23. Three Types of Thinking.

sciousness. What thought or action shall follow another thought or action is determined by the frequency, recency, intensity, and resulting satisfaction of previous associations, other things being equal. If the mind does not arbitrarily determine what shall pass by, it certainly does have the power to choose from among those things as they pass by. It is this ability to choose and to postpone reactions which distinguishes man from other animals.

Now, that we have examined the two extreme types of thinking, we ought to be prepared to orient the middle type, select-associative, Fig. 23, without difficulty. Not all associative thinking is of such random character as that of the women engaged in conversation over the back-yard fence or of the idle men about the fire of the village store. Neither, on the other hand, may the agent or individual be as free to make selections and choose his own terms as was the fisher beside the river. For example, it may be a student in technical manual arts or an industrial arts course wherein he has

been taught and shown just how to make a joint of a certain type, or some other technical operation wherein the teacher has made use of conventional methods of procedure in his instruction and his demonstration. The type of thinking the student engages in when he tries to execute instructions in the making of the project is not to be classed as random; there is a definite goal toward which the student is working. Neither can it be classed as selective in the sense that the student is a free agent to work out his problem as he likes. It is a type of thinking we have chosen to call select-associative—selective in that there is a definite end in mind upon the part of the student in view of which he makes selection of favorable ideas as they pass thru consciousness by association, associative in that the goal and the means are set by society and the race thru the teacher. The chief effort of the boy in his selection is one of determining thru recall the proper means or method of procedure. The sample we get by placing our measuring unit at this middle position, Fig. 23, is classed as associative in pedagogical writings. The reader will do well to remember, however, that it has selective elements but that those selective elements are selective on the part of the race and not the boy; that the boy confines his effort to thinking them over and acting them out thru association.

3. **Evaluation of Types of Thinking.** The first type, random thinking, may be dismissed from further consideration by the statement that it finds a place in the educative process thru necessity rather than thru choice. It is the basis for the second and the third types. Being instinctive, our chief concern is one of direction rather than encouragement. When we give it direction it then becomes type two and three. It is given a place in our discussion because it is a distinct type and one which often is confused with type three as to educational significance. This first type is not regarded highly

in the world's work. Being the most common, the least economical, and requiring as it does no educational investment, it is the least paid. It is the chief mental characteristic of the unskilled labor class. Type two is not so common as type one; its rewards are correspondingly greater. The results it accomplishes are of greater value to society. It is the chief mental characteristic of the skilled labor class. The greatest rewards are reserved for the third type; this is the chief mental characteristic of the inventor or director class.

This stratification of society into the common associative thinking class, or unskilled; select-associative, or the skilled; and the selective, or inventor, or director class is a social arrangement or racial development which finds an exact counterpart in individual development. In the individual there comes first unorganized action and thought. Out of this spontaneity comes more efficient or skilled reactions, because they are aided thru instruction or thru teaching of such associations as race experience has found helpful. Third, comes creative effort most worth while because it is based upon instruction in the things of past experience.

Of course this third type is highly to be desired and every effort made to develop it. However, it should be remembered that most of the world's work is done by type number two, and that it is not only not possible to produce any very large number of striking examples of number three type, but that the most effective training for number three type requires a certain amount of elementary experience in number one and number two as preliminaries for number three.

4. Instruction on the Lower and the Higher Plane—Storage of Knowledge and Acquisition of Mechanical Skill. When pupils are required to comprehend and retain facts as an aim; when skill is aimed at as an end in itself, this, Dr. Frank McMurry has characterized as instruction on a lower plane. When facts are to be comprehended and remembered

as means not ends; when efficiency is the goal, and the aim is to make pupils high minded, judicious, forceful, self-reliant,—this he calls instruction on a higher plane.

Quite evidently the meaning intended to be conveyed is that of the two justifications: Justification thru similarity of subject-matter and similarity of method of procedure, and justification thru the development of ideals and principles and rules that may serve as connecting links to a wider range of experience than the little specific experiences given in school; this latter is to be the chief justification. By instruction on the lower plane he means instruction which emphasizes mere associative thinking—emphasis upon what to do and how to do it rather than why a thing is done as it is. By instruction on the higher plane he refers to that type of instruction which emphasizes the method of selective or purposive thinking, initiative, originality, inventiveness, not of the teacher but of the pupil. When a boy is given a blueprint and told just how to proceed in the making of a mechanical drawing copy or a tracing of this blueprint,—this type of instruction he would class as on a lower plane. The associations the pupil makes in making his mechanical drawing copy or his tracing are those the teacher has made for him. The thinking for the boy is reproductive rather than productive. An excellent copy or tracing may result and yet the boy may be ignorant of the meaning of the drawing or of the principles involved in its construction and fail to dissociate such ideals as neatness, etc. Not so with the teacher who designed the project and made the original tracing and blueprint. The designing of the project necessitated selection, analysis, reasoning. Again, a workman digging a foundation for a house has always associated "rock encountered in excavating" with "throw it out." He comes upon a rock which is so large it cannot be thrown out without special equipment not at hand. Analysis of the situation, selection of the favorable ideas which pass by in

associative thinking enable him to associate the idea of the rock almost below excavation level with the idea of digging around it and letting it sink a little lower and not trying to take it out, and a new solution is afforded.

It is this resourceful attitude of mind, this refusal to be non-plussed by all situations except those which are most habitual that Dr. McMurry considers the end of education.

5. The Danger in Extreme Emphasis upon Manual and Industrial Arts as a Means of Developing So-called Generalized Habits of Reaction—The Necessity of Associative Thinking as a Preliminary to Selective Thinking. It is quite possible for one to deduce from argument for extreme emphasis upon manual and industrial arts as a means of developing initiative, resourcefulness, etc., that subject-matter and conventional method of procedure are of no moment. Not infrequently, educators in their eagerness to point out the limitations of associative thinking and the advantages of selective thinking lead young teachers to conclude that associative thinking in its entirety is to be avoided as an undesirable thing in education.

As a matter of fact the development of initiative, originality, resourceful attitude of mind, etc., are themselves means and not ends. The end is the efficient application of these ideals, and such applications imply necessity for attention to subject-matter and methods. A man may have a Ph. D., a sign that he is considered by some higher institution of learning as possessed of a resourceful attitude of mind, and still find himself utterly non-plussed in the presence of a stalled automobile engine he happens to be driving, while a very "ignorant" mechanic may meet the situation by so simple an operation as removing and cleaning a spark plug. As a counter irritant there may be offered Prof. Thorndike's rather extreme opposite view: "Training the mind means the development of thousands of particular independent capacities,

the formation of countless particular habits, for the working of any mental capacity depends upon the concrete data with which it works." (*Principles of Teaching,* p. 248.) Dr. Judd states the case for associative thinking when he says, "Empirical concretes and not abstractions give the basis for associations." Associations in turn give the basis for selective thinking. Associative thinking is an absolute prerequisite for selective thinking and most of the world's work is carried on thru this rather than thru high selective. The fisherman by the river, to revert to our original illustration, could not pick out suitable firewood for his winter's supply did not the stream carry an array of materials past.

6. The Danger in Extreme Emphasis Upon Associative Thinking to the Neglect of Selective. If teachers of technical manual arts and industrial arts need to be warned of dangers in extreme emphasis upon one or the other of the factors mentioned above, observation and conversation would seem to indicate that the warning should be one against extreme emphasis upon associative rather than upon selective thinking. From the very nature of the problem it is to be expected that technical manual and industrial arts teachers will concern themselves very largely with the problem of habituating their pupils to certain lines of thought and action thru associations wherein race experience and conventional methods of procedure play a large part. They should understand, however, that the product of such instruction is not of the highest type. They should know that many of the specific experiences they give their pupils may easily be made to take the form of generalizations by which latter means their ability to meet new environment or new situations is made possible. A student taught to think of roof framing, referring to our past illustration, in terms of principles rather than in terms of certain numbers to take on the tongue and blade for each pitch and each cut of each member, will most

certainly be better able to meet the many diverse problems of roof framing than one who has not been taught to generalize his particulars of instruction.

In fact, only in this manner can such a student meet situations which are new—situations he has not been taught to meet specifically. One is justified in entertaining a healthy skepticism as to the teaching methods and ability of any manual or industrial arts teacher who prides himself on never reading the literature of his craft or who feels that books possess nothing for him. Generalized experiences are passed on from one to another by or thru words, either word of mouth or the printed page, largely the printed page. The teacher who never reads usually never thinks in terms beyond the particular associations taught him; he seldom generalizes. His pupils consequently receive little encouragement to do more. Race progress, socially and economically, is possible only thru selective thinking. Even our select-associative type is not the highest type. There must be opportunity for the third type, selective thinking.

7. **Harmonization of Conflicting Aims in Associative and Selective Thinking.** It is impossible to place extreme emphasis upon associative and selective thinking at one and the same time, just as it is impossible for the fisherman to let all the fire and other woods float by and yet take out some for his own use. For example, it is impossible, as has been previously stated, to teach a boy just how to make a mortise-and-tenon joint according to methods race experience has developed and at the same time have him discover how a mortise-and-tenon joint is to be made. The former is associative; the latter selective. The former is instruction on a lower plane; the latter is supposed to be instruction on a higher plane. The former is deductive; the latter inductive. The former defeats initiative, the latter is supposed to give it exercise, etc. The former is our type number two; the latter

is supposed to be number three, and right here is where trouble often comes. It is more likely to be number one rather than number three when men of purely academic training try to develop creative effort in technical manual or in industrial arts. They fail to recognize that instruction must precede creative effort if it is to be worth while—if it is to be anything more than spontaneity, a preliminary to instruction.

How then can we teach pupils the conventions of any craft, give them the benefit of what the race has discovered and also develop initiative, a resourceful attitude of mind, etc? If we cannot tell a pupil how a thing is to be done and at the same time have him discover how it is to be done, what can we do? The answer, obviously, is, first, arrange the experiences so that those conventions the race has developed, and which children could not discover in the time available, will be given them by the teacher deductively as instruction. Second, arrange enough groups of experiences that pupils will be encouraged to put together such information and experiences in new combinations, and at such times that invention, initiative, etc., may be encouraged and strengthened.

In seventh grade woodwork, for example, teach boys proper methods of squaring-up stock, etc., by instruction and demonstration. If this type of instruction is criticized as on a lower plane, as not calculated to develop a resourceful attitude of mind, grant that it is, but justify it in your own mind and in your practice by having it serve as the instructional part of Froebel's (1) spontaneity, (2) instruction, (3) creative effort. Do not, however, fail to intersperse groups which will allow pupils to modify dimensions and design projects of their own, just as soon as instruction and skill make this possible and profitable. We cannot accomplish skill and intelligence at one and the same time; we can, however, alternate the emphasis and thus accomplish a result that best makes for progress. Technical manual training and industrial arts must,

as far as conditions permit, strive to develop the qualities mentioned by Dr. McMurry; this can be done best and only thru instruction on a lower plane as a prerequisite to instruction on a higher plane. Care should be taken to distinguish between creative effort based upon instruction and spontaneity not so based. Each has its place but they are essentially different stages or aspects of the educational process.

The inference as to method in general, then, is clear: We are to pay attention to the empirical concretes; education is to be based upon specific concrete experiences. Out of these experiences are to come the generalizations, the abstractions, the rules, the theory, the ideals which shall serve to connect these specific, concrete experiences with other specific, concrete experiences not otherwise related. Such a method demands more than mere generalization and abstraction; it demands application of these to new situations or experiences. If it were desired to produce an intelligent carpentry foreman, one with a resourceful attitude of mind, we must not try to do this by having him disregard the subject-matter of carpentry. We must not have him dwell always in the world of random experimentation on the ground that in such a world he is exercising initiative and avoiding associative thinking which comes thru being told how and what to do. We must not expect him to develop a resourceful attitude of mind that is really worth while without passing thru a certain amount of elementary thought experience such as number one and number two before stressing number three. In other words, utilizing the instincts of number one we would by instruction or association hitch on all the lessons race experiences can give about carpentry. Out of this should come an ability to do real creative thinking and execution in carpentry. The educational process is complete only when this embryo has had opportunity to apply his derived theory to new situations.

8. Modifications in Practice Due to Variation in Aims.

In all that has been said in the discussion so far, the assumption has been that conditions are ideal and that every boy has time and financial means to pursue a type of educational experience which makes due allowance for natural development and which is calculated to train him for the highest positions, whether in a trade or other line of life activity. Such ideal conditions do not exist, of course. It will be found necessary, therefore, to institute practices to meet social and economic conditions which come short of preparing a student for this highest type.

One should not expect, for example, to find in an elementary industrial arts course, wherein limited time makes a hurried preparation for industry necessary, much attention being devoted to the development of originality, initiative, resourceful attitude of mind, etc. Rather the attention will be found centered upon associative thinking wherein the school seeks to give to the boy highly specific associations, such as it can, pertaining to some specific activity, determining these associations from race experience and immediate individual need. Likewise, a boy being trained for the skilled labor class will be given more training thru associations and less opportunity for generalizations than will another being trained for directorship.

Again, it may be well to call attention to the fact that emphasis upon generalizations, rules, theory, etc., may justly find a place in certain types of schools at the expense of attention to specific concrete experiences. Such work, however, is subject to serious limitations unless it is based upon at least a small amount of individual experience with the concrete experiences or data out of which the theory is deduced and at least a limited opportunity for application.

No school should be judged adversely as to method until its aims are known. Even then, a fair-minded investigator will not judge a school until he has made a survey of its

work as a whole. It is possible for one to emphasize associative thinking for a period of a year or even more, emphasizing instruction and conventional methods of procedure. Manifestly, if the plan of such a one calls for opportunity to make applications of such instruction the following year in creative effort, an inspector would be unjust to condemn the work of this teacher upon a visit or two to his seventh grade work when his eighth grade work called for opportunity for expression. It might be the better part of wisdom to give such opportunities at less great intervals—the principle, however, is the same. Neither will a fair-minded inspector condemn instruction which is associative largely when such work is for special ends, such as early entrance into industry.

9. Summary. The educative process is concerned with associative and with selective thinking of certain well-defined types. Much of confusion and misunderstanding has arisen because the evaluating unit used is too large to give sufficient definiteness in attempts to analyze situations as they have to do with types of thinking. In no case is an experience one of associative thinking solely, or of selective thinking solely. In every case of associative thinking there is selection and in every case of selective thinking there is association; it is a question of degree. For this reason we are at liberty to choose any measuring unit we may consider advantageous. The unit which divides situations into three instead of two parts will be used in the discussions which follow.

Our three types are: common associative, select-associative, selective. The new term select-associative is introduced to designate a type of thinking which is more selective than common associative, and more dependent upon association than selective. Common associative is that type of thought wherein there is apparently no central idea, just a mass of detail—an uncontrolled stream carrying every variety of floating thing related in time rather than in reason. Selective thinking is the

type wherein the individual sets his own goal, works out subordinate detail, etc., thru his own analysis and selection. Our select-associative type is a type wherein there is a central idea and subordinate detail, but a type wherein the teacher, or society thru the teacher, has provided the central idea and given it its setting thru careful instruction and demonstration.

In our attempts to evaluate these different types of thinking we may dismiss type one with the statement that it finds a place in the educative process thru necessity rather than thru choice. It is the basis for the second and third types. Being instinctive, the chief concern is one of direction rather than of encouragement. The first type is not regarded highly in the work of the world. It is the chief mental characteristic of the unskilled labor class. Type two is not so common and its rewards are correspondingly greater. It is the chief mental characteristic of the skilled labor class. The greatest rewards are reserved for type three which is the chief mental characteristic of the inventor or director class. This stratification of society into common associative, select-associative, and selective types of thinking classes is a social arrangement or racial development which finds an exact counterpart in individual development. While the third type is the highest and effort should be made to develop it, it should be remembered that most of the world's work is done by type two, and that type three depends upon a certain amount of experience in types two and one as a preliminary.

When pupils are required to comprehend and retain facts as an aim—when skill is aimed at as an end in itself, this, Dr. McMurry characterizes as instruction on a lower plane. When facts are comprehended and remembered as means not ends, when efficiency is the goal, and the aim is to make pupils high minded, judicious, forceful, self-reliant, this, he calls instruction on a higher plane. By instruction on a lower plane, he

evidently means instruction which depends upon associative thinking, similarity of subject-matter and similarity of method of procedure. By instruction on a higher plane he means instruction which depends upon selective thinking, upon generalizations. Generalizations, or development of a resourceful attitude of mind, he considers the end and aim of education.

Not infrequently, educators in their eagerness to point out the limitations of associative thinking and the advantages of selective thinking lead young teachers to conclude that associative thinking is a thing to be avoided. Such teachers need to be reminded that "Empirical concretes not abstractions give the basis for associations," and that associations in turn give the basis for selective thinking.

On the other hand, teachers of shopwork often become so concerned with giving to their pupils instruction and demonstrations of conventional methods of procedure, in order that they may have the benefit of race experience, that they forget race progress is possible only thru selective thinking and that the type of thinking their pupils are getting by such methods is not adequate.

It is impossible to place emphasis upon associative and selective thinking at one and the same time. One cannot tell a boy how to make a mortise-and-tenon joint and at the same time have him discover how it is to be done. It is possible to harmonize conflicting aims, or to attend to the two kinds of thinking by alternation wherein there shall be interspersed with the instructional groups other groups which give opportunity for application of such instruction in new ways. The inference as to method in general is clear: we are to pay attention to empirical concretes—specific experiences with concrete materials; out of these will come abstractions or generalizations, rules, theory, ideals; these in turn are to serve as connecting links whereby the student may be enabled

to make more economical use of past experiences in meeting new situations.

The discussion so far has presupposed ideal conditions wherein only the needs of the individual psychologically are considered. It must be recognized that social and economic need will make necessary the establishing of schools and classes for the economically unfortunate wherein emphasis may be placed upon a type of reaction manifestly not involving a high type of thinking. Again, there may be other types of school which may, with equal justice, emphasize generalized experiences at the expense of concrete or specific. No school or class should be judged adversely until a survey of its work as a whole, together with its aims, has been made.

Reference Reading:

Thorndike: *Principles of Teaching,* Chapters IX, X.
James: *Talks to Teachers,* Chapter XIII.
Final Report of Board of Estimate and Apportionment, Committee on School Inquiry, New York City, 1911-1913, Vol. 1, pp. 56-58, 211-236, 249-259, 294-298.
Dewey: *How We Think,* Chapter VI.

Class Discussion.

1. Give an example of common associative thinking.
2. Give an example of selective thinking. Of selective associative thinking.
3. Differentiate common associative, select-associative, and selective thinking by means of examples from the manual and industrial arts.
4. When the teacher so organizes his work that pupils are required to comprehend and retain facts as an aim—when skill is aimed at as an end in itself—this, Dr. McMurry calls instruction on the lower plane—"storage of knowlege and acquisition of mechanical skill." By what right does he call it so?
5. When facts are comprehended and remembered as means, not ends, when efficiency is the goal, and the aim is to make pupils high-minded, judicious, forceful, self-reliant, this he calls "instruction on the higher plane." By what right?
6. In the light of past readings in Thorndike's *Principles of Teaching,* do you conclude that there is no place in the educational scheme for emphasis upon that kind of instruc-

tion which McMurry designates instruction on the lower plane? Justify your answer.

7. Which is worse, never teaching the conventions of the activity (Conventional methods of procedure developed thru race experience and handed down from generation to generation—Cf. Sargent: *Fine and Industial Arts in Elementary Schools,* pp. 6, 7) in which the pupils are engaged on the ground that to do so is to give instruction on a lower plane, or never to allow initiative (selective thinking) upon the part of the pupils in that activity?
8. State your order of procedure in a proposed manual or industrial arts problem whereby you introduce your pupils to experiences in selective thinking and at the same time make such thinking efficient because based upon a knowledge of conventions involved. (Cf. Griffith: *Correlated Courses,* pp. 18-20) (Cf. Sargent: *Fine and Industrial Arts,* pp. 52, 89.)
9. Classify the following as to plane of instruction: Teacher hands a pupil a blueprint day after day to be copied or traced; teacher marks on execution.
10. Examine Bennett's *Problems in Mechanical Drawing* and classify the types of instruction.
11. A pupil makes a booklet from specific instructions; classify such instruction. What other experiences are needed to give the child experiences based upon instruction on a higher plane? Note that "instruction on the higher plane implies a central idea and subordinate detail. Associative thinking is more or less rambling with no central idea—just a mass of detail related to one another in time rather than in reason."
12. Differentiate or designate the type of thinking predominant in each of the following: expressional manual arts; technical manual arts for general educational purposes; industrial arts wherein the aim is a machine tender, a skilled mechanic, a foreman.

CHAPTER XI

TEACHING METHODS IN MANUAL AND INDUSTRIAL ARTS

1. Teaching Methods. Two distinct methods are commonly recognized, the deductive, or imitative and the inductive, or heuristic. The terms discovery method and inventive method will be found not uncommonly. Discovery and invention are essentially inductive and will be so treated in the discussion which follows.

Just as we found in the consideration of associative and selective thinking of the preceding chapter, that schoolmen were divided into two rather hostile camps because of the selection of too large a unit of measurement for purposes of analysis, so in method discussions we find the same situation. As it was found possible to reconcile conflicting ideas in the matter of associative vs. selective thinking values by assuming a smaller unit or interval for purposes of differentiation, so we shall be able to overcome the difficulty of the methods conflict. Instead of debating the question as to which is the proper method—inductive or deductive, discovery and invention or imitation, we may have three methods, 1. Inductive method, 2. Deductive method, 3. Complete method.

Those who see only skill and automatic connections, or feeling, as an end in education, path number 3, Fig. 1, are bound to champion imitation and demonstration—deductive teaching. Those who see in education the development of a resourceful attitude of mind—intellect, will emphasize the heuristic or inductive method. Those who see in education the necessity for developing a certain amount of skill and technic that the effort to develop a resourceful attitude of mind may be worth while because of its being based upon some degree of understanding and some skill, and who insist

that this resourceful attitude shall find expression in efficient application, will make use of both the imitative, or deductive and the heuristic, or inductive methods, the complete method.

It must be recognized that it is only for the sake of analysis that we can differentiate these—there can be no inductive thinking without deduction, no deductive thought without induction. That is, no new idea can get into the mind unless it is related to some old idea for interpretation. For example, a geographer goes into a new country. He finds new rivers and new mountains. He plots them and makes a map to show their locations. The process is one of discovery, induction. The emphasis is on the new. Now in a minor degree the process was deductive. Were it not for his past experiences with, or knowledge of, the nature of rivers and mountains he would not have recognized the new phenomena as such. Now, let another person take this map and go to this country. He looks at the map and notes a river located at such a place. He goes to the place, finds the river by means of the map. The process here is essentially deductive—the emphasis is upon the old, upon the map. Yet the new is present too. These methods differ then in emphasis, in direction of approach.

2. **The Deductive or Imitative Method.** The chief advantage of this method is economy of time. If society wants a boy to learn how to square-up a piece of stock, or to learn the conventional way of making a mortise-and-tenon joint, the quickest way is to tell him and show him just how to do this. In the boy's effort to make the joint and to square-up the stock there is a certain amount of discovery going on, of course, but the chief mental effort is one of association in time rather than in reason, trying to recall what was heard and what was seen in the lecture and demonstration. The process is one of imitation rather than of discovery so far as the learning method is concerned.

The weakness of this type of instruction lies in the fact that it does not tend to develop a resourceful attitude of mind but rather the reverse, dependence upon others. While discovery is present at first in varying degree, the quicker the mental connections can be eliminated thru the direct connecting of sensation and reaction in this particular thing the more efficient the worker becomes. The development of a resourceful attitude of mind implies emphasis upon mental connections, and any method of instruction which tends to eliminate such connections by the making of the connection thru feeling cannot be considered a fitting method for that purpose.

It should be recognized that there is a large place for discovery in the execution of the most carefully demonstrated exercise. This is well illustrated in the following: "There is a psychology in every tool with which a child deals. For example, take the saw. If you are a child you grasp it in your hand and begin to work. Any child gets from this tool such an abundance of bewildering experiences that he hardly knows what to do with it. He feels it in his hand and when it comes in contact with the wood, he feels the pressure, he feels the new sensations which come to him thru his skin, he looks at the point of attack and his eyes are full of color and form. This great mass of experience flowing into his consciousness bewilders him. We say to him, 'go slowly, take one stroke, then wait and readjust.' If he should go on, at the end of the first stroke, he would be getting so much more experience that he would not know what to do with himself. Watch him after he has made a little way into the board with the saw. Now, the saw turns and binds. He gets more experience but he does not realize the fact that he has been turning the saw. The moment your skilled technician gets the sensation that comes from the saw binding in the groove, he knows what is wrong and he handles the saw so as to bring it in proper relation again with a turn of his hand.

But your boy is bewildered. He gets so much sensation he does not have attention for anything else. There are more lines before him than he has any appreciation of, the lines get mixed up on the saw, and if he lands anywhere near the line he is very grateful for that much of an achievement. The process of learning is a slow unravelling of all this mass of experience. Skill comes from adjusting movement to sensation." (Judd, 1915 Report, Western Drawing and Manual Training Association.)

This discovery process, as is indicated by the quotation, is ample enough, with every aid that can be given thru careful demonstration and instruction in the ways race experience has developed, to occupy the attention of the boy. If new processes are introduced this same type of experience is being repeated in new settings so that even in a four-year manual training course where demonstrations are a regular feature of the full four years' work, there is discovery. This experience, however, is not a sufficient one. The reactions are so closely related in time to the sensations thru feeling that intellect does not have as great opportunity to function as must needs be to make for that which the educator chooses to call a resourceful attitude of mind.

3. The Inductive or Heuristic Method. The inductive or heuristic method, in its primary significance, refers to a learning thru mere discovery wherein no definite goal is set. Like the explorers of a new country the pupil travels about as fancy dictates. Of the three stages of development, (1) spontaneity, (2) instruction, (3) creative effort, the heuristic method, in its primary meaning, refers to the experiences of type number 1.

Among educators, however, the inductive or heuristic method more nearly approximates what might be designated the inventive method. A definite goal is set, either by pupil or teacher, and the pupil is supposed to work out an adequate

solution. Instead of the teacher's leading the way, telling and showing, as in the imitative or deductive method, the pupil leads the way, the teacher following and not interfering except as the pupil goes so far astray that the experience becomes of little value.

It is not necessary to set forth here the advantages which come thru the inductive or heuristic method, the assigned readings cover these sufficiently. Suffice it to state that race progress is possible only thru this type of thinking. "Intelligent self direction, an alert resourceful attitude of mind, and power to plan means to an end are its fruits when wisely administered."

4. The Complete Method. The complete method is neither inductive nor deductive but both in varying degree. First one and then the other, alternating as the unfolding nature of the child demands. Froebel's spontaneity, instruction and creative effort point the way. Creative effort, discovery, or invention, is of slight value until based upon a knowledge of, and a fair degree of skill in, the conventions of the activity in which the creative effort is to be. Instruction in conventional methods of procedure is of slight value unless based upon a feeling of real need thru spontaneous activity or activity not directed and controlled by instruction. Spontaneous effort, in the very nature of things, must be self initiated and free from external authority, inductive. It is a discovery process with all the limitations which come from an attempt at creative work without information which comes thru race experience, and skill. Instruction consists in giving to the pupil information such as the race has collected thru countless ages of experimentation, with an opportunity to acquire enough skill to make possible the next step in the learning process. Instruction is deductive, and under authority. It is not free except as the individual has been brought to see a real need thru the experiences of spontaneous

activity, and then only partially, but is one of the steps toward a real freedom. Creative effort consists in utilizing all the information and skill obtained during the period of instruction toward working out experiences not encompassed in instruction.

The introduction to the 1912 Illinois State Course of Study in Manual Arts, by Prof. Charles A. Bennett, is a practical statement which gives full recognition to the principles just enunciated: "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 technic 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, classifications, 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."

5. Modification in Method Due to Variation in Aims. Aims will vary; likewise, we must expect methods to vary with these varying aims. While we shall find in every attempt to use any one method elements of the others, as has been pointed out, we may profitably indicate variations in placing

emphasis. For example, primary grades will be found emphasizing spontaneity in expressional manual arts; grammar grades and early high school will be found emphasizing instruction in conventional methods of procedure, later high school will place emphasis upon creative effort. All of these grades, primary, grammar, and high school, will give attention to technical subject-matter and methods, and all of them to a certain degree will allow for spontaneity and creative effort, or should, but the emphasis is as stated. Even in the work of a given grade in any given technical work, there will be groups set aside for the exercise of creative effort, where the work is wisely planned. The instructional groups will predominate, however, in the upper grades and early high school.

Then, there is the need of the industrial arts group for variation in methods emphasis. Those boys who are to become foremen and directors will need more groups wherein creative effort is based upon instruction than will the type which is to go into low skilled or semi-skilled work where ability to follow orders and execute with facility is the chief prerequisite.

In general, wherever we seek to develop skill, we shall make use of authority, imitation, demonstration. If we want to develop initiative, resourcefulness, we shall make use of authority, imitation, demonstration, no more than is absolutely necessary to give a sufficient basis in understanding and skill for experimentation upon the part of the pupil.

As in thinking types, so in methods, the work of a teacher must not be condemned until the work as a whole of that teacher has been surveyed, including a consideration of the special needs of the class of pupils he may be instructing.

6. Summary. Two distinct methods of teaching are commonly recognized—deductive or imitative and inductive or heuristic. We may have three methods, and, for purposes

of harmonizing conflicting aims, we offer the following: (1) inductive, (2) deductive, (3) complete. Those who emphasize automatic connections, feeling, will champion imitation and the deductive method. Those who seek to stress intellect and the development of a resourceful attitude of mind will make use of the inductive or heuristic method. Those who seek to emphasize creative effort based upon information and experience in conventional methods of procedure, will make use of both the imitative and the heuristic, the complete method. It must be recognized that it is only for the sake of analysis that we can differentiate inductive from deductive. In every act of induction there are deductive elements and vice versa. Methods differ in emphasis and direction, not kind.

The chief advantage of the deductive or imitative method is one of economy of time. The weakness of this type lies in the fact that it fails to develop a resourceful attitude of mind. Rather does it develop a dependence upon others. It should be recognized that there is a large place for discovery in the execution of even the most carefully demonstrated exercise. This experience, however, is not sufficient to class it as of that type the educator has in mind when he speaks of developing a resourceful attitude of mind.

The inductive or heuristic method, in its primary significance, refers to learning thru mere discovery wherein no definite goal is set. Among educators, however, it has reference to a situation wherein a definite goal is set, either by the pupil or the teacher, and the pupil asked to work out an adequate solution. Intelligence and self direction, an alert, resourceful attitude of mind, and power to plan means to an end are its fruits when wisely administered.

The complete method is neither inductive nor deductive but both in varying degree. Froebel's (1) spontaneity, (2) instruction, (3) creative effort point the way.

Aims will vary; likewise we must expect methods in the manual arts to vary with these. The industrial arts will be found to have need for these same variations in method. In general, whenever we seek to develop skill we shall make use of authority, imitation, demonstration. If we desire to develop a resourceful attitude of mind, initiative, originality, etc., we shall make use of these no more than is necessary to give a basis in understanding and skill for purposes of experimentation on the part of the pupil. As in thinking types, so in methods, the work of a teacher should not be condemned until the work of that teacher as a whole has been surveyed.

Reference Reading:

Charters: *Methods of Teaching,* Chapters XIII, XIV.
Bennett: *The Manual Arts,* Chapter VIII.
Bagley: *The Educative Process,* pp. 239-247.
Thorndike: *Education,* pp. 168-196.
DeGarmo: *Principles of Secondary Education,* Vol. II, pp. 178-182.
Dewey: *How We Think,* Chapter VII.
Griffith: *Correlated Courses in Woodwork and Mechanical Drawing,* pp. 7-11, 41-51.

Class Discussion:

1. Discuss rather fully the advantages and the limitations of the deductive or imitative method.
2. Discuss the advantages and limitations of inductive or heuristic method when not based upon instruction in the conventional ways of manipulating the materials under consideration.
3. Differentiate and illustrate the complete method.
4. In each of the above methods, would emphasis placed upon one method or another be modified were a certain grade specified, as primary, grammar, high school, university?
5. What method would most likely be found wherein pupils were being prepared for occupations industrially requiring low skill or limited skill? What method where a wide range of intelligence and skill is to be demanded? Where the pupils are being trained for leadership in industry, such as foremen?

CHAPTER XII

THE LESSON—ITS COMPONENT PARTS

1. **The Necessity for Carefully Matured Plans.** Even as consciousness in youth evolves out of a "big, blooming, buzzing confusion" and takes form and becomes of value as it differentiates one thing or experience from another or others, so good teaching becomes of value just in proportion as the young teacher differentiates ideals, aims, and the details of preparation and presentation of subject-matter. Inspiration, feeling, instinct are valuable, of course, as has been pointed out, but intelligent direction is no less a part of the teaching process.

There should be thought out the larger plans of organization of teaching materials. The essential governing factors as to choice of subject-matter and method of presentation, have been presented in preceding lessons. Typical outlines in various media and for various grades will be found in Appendix II. This larger organization is best treated under *Organization and Administration of Manual and Industrial Arts,* the subject of a companion text in preparation. Taking for granted this larger organization of subject-matter, the present discussion will concern itself with the detailed daily or weekly lesson plan, and particularly with method of presentation.

2. **The Six Formal Steps.** For purposes of analysis, the followers of Herbart frequently divide a lesson into six parts; (1) preparation, (2) presentation, (3) comparison, (4) abstraction, (5) generalization, (6) verification or application. In actual teaching, of course, the lesson goes forward in this order only in a general way. The division, too, presupposes that each lesson is a complete whole, whereas certain lessons for rather extended periods of time may be given

primarily as preparation lessons looking forward to future application. In such cases steps number four and number five may receive but slight emphasis. Such lessons will be strongly deductive, imitative as opposed to inductive and developmental. Later lessons will be strongly inductive, calculated to develop initiative and creative effort.

Preparation consists in having the pupils recall to mind certain previous knowledge or information and experience, which knowledge, information and experience are necessary as a means of connecting up new knowledge or information and experience with which it is desired to make the pupils acquainted. Preparation in information in technical manual arts is mainly a matter of securing recall thru examinatory questions or the recitation on assigned readings, bearing on past experiences. (Cf. type form of daily lesson plan, which follows.)

Presentation in technical manual arts consists in conveying to the pupils new materials for assimilation. This is usually done by means of demonstration and instruction.

Comparison consists in the association of one set of experiences with another set. For example, a student may be taught to hold the head of the gage against the face edge in gaging a piece of stock to width for a hat rack. He may be taught to hold it against the face edge in gaging a piece of stock to width for a counting board, etc. Before he can take the next step, abstraction, he must have compared one set of experiences with other sets, noting wherein they are similar and wherein they differ. In the case of the gaging, he should note in such comparisons that the gage head is always held against the face edge, abstracting the common element; then he is ready to take the next step, generalization, and make the deduction that gaging for width should always be done with the gage head or block against the face edge.

In similar manner he may be got to deduce other principles or rules for working wood or metal.

Verification, or application, consists in taking such derived principles or rules, and making them serve to shorten the time of experimentation. Once the student has learned that, in gaging widths, the gage block is to be held against the face edge, he is to be given an opportunity to govern himself accordingly in other situations similar in respect to this factor until the habit of always holding the gage head against the face edge in gaging width is fixed.

3. The Six Formal Steps Not Always Inductive. It is customary to associate the six formal steps with the inductive method primarily with its emphasis upon the development of a resourceful attitude of mind. The six formal steps might as well be associated with the deductive method with its emphasis upon authority, upon subject-matter and method. The determining factor is whether the teacher or the pupils perform steps 3, 4, and 5, make the comparisons, abstractions and generalizations. Only so long as the children make the comparisons and draw the correct conclusions is the method inductive. In actual practice the teacher often either cannot or does not consider it advisable to wait long enough for the children to do this but tells them the deduction, or rule, or principle to be derived. The method, then, is essentially deductive. Both types of teaching method are legitimate. The ends to be served are different, but both are legitimate. Sometimes one, sometimes the other is to be emphasized. Sometimes the alternation of emphasis covers a period of years; sometimes it is so immediate it is difficult to distinguish when one and when the other is being served.

4. Not Every Lesson Needs to Be Inductive. There are those educators who would have every lesson inductive in method. The young teacher will do well to recall that

knowledge of subject-matter and conventional method of procedure and the development of a fair degree of skill are essential factors in the educational process even as in the development of a resourceful attitude of mind; that the telling or showing or associative or deductive method is the most effective method of giving the young this heritage of race experience. It is not a sin pedagogically, for example, to tell a boy, when he does his first gaging for width, that the gage is always to be held against the face edge in gaging for width, if in so doing the way is being prepared and time thereby saved for the setting of a larger problem in analysis or comparison and generalization. The unfortunate thing is never to set any problems wherein the pupil will be called to do analytical thinking, on the one hand, and on the other to mislead oneself into thinking he is providing opportunities for such thinking when he is defeating such ends thru unwillingness to wait for the pupils to make the necessary deductions.

5. Modern Conception of Method. While the method of teaching developed by Herbart and his followers has proven wonderfully helpful in assisting young teachers the better to formulate and regulate the conduct of the instructional process, it is open to certain objections philosophically which make it more or less unacceptable to the modern educator. Representing, as it does, a conception of instruction as something static and fundamentally logical it has had to give way to a conception of instruction as something dynamic, "moving," psychological. As a means of assisting the teacher in formulating his own thought into logical form thru careful analysis, it is still practically helpful; as a conception of what the conduct of the instructional period is likely to be, or should be like, it is misleading.

Prof. John Dewey, in *How We Think,* has formulated a

more acceptable conception of instruction. In this conception of the method of instruction we have the occurrence of a problem or a puzzling phenomenon; observation, inspection of facts to locate and clear up the problem; then the formation of a hypothesis or the suggestion of a possible solution together with its elaboration by reasoning; then the testing of the elaborated idea by using it as a guide to new observations and experimentations. Or, as Dean W. W. Charters states it:

1. The problem { defined / or / undefined
2. The solution { aided by suggestion as necessary / or / by elaboration
3. Verification.

The young teacher will do well to read carefully Chapter XV in Dewey's *How We Think* and Chapters XIV, XV, XIX in Charter's *Methods of Teaching.* He will then be able to profit by a study of such detailed lesson planning directions as are found in the assigned readings without coming to grief. He will know that, once the lesson plan has been formulated in all its details and his own thought clarified thereby, the best thing for him to do is to lay the formal, logical plan aside and concentrate his attention during the development of the lesson upon taking advantage of every opening which presents itself favoring the solution of the problem, irrespective of its place in the logical arrangement previously made. He must, of course, keep in mind the problem, the general plan of attack which he has formulated for securing the solution, and see that the supposed solution meets the test of verification thru utilization in further experimentation. He must also have his materials and tools prepared and

ready just as far as this can be anticipated. He must have some system for the effective management of the class so that he may take advantage of all such administrative devices as will aid in the successful solution of the problem under consideration.

6. Instructive Question Rather than Directive Statement. As far as possible the preliminary and instructive question should be used in the setting and in the solution of a problem rather than directive statement, "telling as little as possible, and inducing the pupils to discover as much as possible." Of the two extremes, never telling anything and always telling everything, neither is better. Even in the most intricate situation it is possible by means of preliminary and instructive questions to vitalize a demonstration as it cannot be done by mere direction and at the same time cause no loss in the matter of presentation. For example, let it be the problem of conveying the idea of the need for making working drawings in beginning shopwork. The teacher may convey the idea by a statement of fact as he sees it. He may convey the same idea by asking if any boy in the class has ever seen a mechanic looking at a blue paper with white lines on it and from this beginning thru other preliminary instructive questions develop the idea of need for drawings. The second method is superior to the first in so many ways that it is surprising that manual and industrial arts teaching makes no more use of it than it does in actual practice. There are times, of course, when it is quite evident the pupils will have to be told. Even here the preliminary question within certain limits is of value. It serves to impress upon each boy the fact that he does not know and that he must attend to instruction or demonstration as it has to do with that particular thing. It becomes an aid in preparation.

Preliminary and instructive questions are of the greatest

aid in the proper maintenance of discipline or conduct. Only as pupils are participants are they attentive to the work in hand. A good teacher not infrequently asks questions as he demonstrates for no other reason than to cause his class to feel that they are a necessary part of the demonstration. That is, he may know that they have no adequate answer for the various steps in the first making of a mortise-and-tenon joint, but he questions as he demonstrates nevertheless. Of course the questions must be sensible or reasonable ones and have a direct bearing on the work in hand.

7. Intermediate Plan Form. The type outlines in Appendix II give the first and largest outlook of subject-matter for teaching purposes. Coordinate with Method of Presentation are more detailed factors of organization which, to a certain extent depend upon the method of presentation and vice versa. These may be considered in what, for want of a better name, may be designated Intermediate Plan Form. The following are the factors to be considered:

Subject	Tools
Group or Block	Materials
Processes or Sequence of Operations	Correlations
Method of Instruction	Cost
Projects to Cover	Sketches (Teacher's)
	Reading References (for Teachers)

The outline may be as follows:

EXAMPLE 1.

Subject: Story Telling; Expressional or Illustrative Handwork.

I. Group. Paper Cutting and Poster Making, Stories, Grade I.

II. Projects. Various incidents connected with the Story of the Three Bears.

III. Processes. Paper cutting, mounting cuttings.

IV. Method of Instruction.

Story of the Three Bears developed by members of the class, if possible. If not, to be told by teacher. By ques-

tion and answer, develop idea of incident or incidents to be illustrated.
Develop ideas of number of bears, sizes, etc.
Develop idea of number of chairs, sizes and condition, etc., those things which are to enter into illustrating the incident chosen or agreed upon by the children.
Which bear's chair was damaged most? How will it look? etc.
How do chairs look? How do bears look?
Develop the desire on the part of the children to make cuttings.
Develop the idea of relative spacings and placings of the objects which are to make up the incident. Instruct the class about the cutting. Show the class how the pasting is to be done.

V. *Tools.* Scissors.
VI. *Materials.* Rough gray paper, or scrap paper; paste.
VII. *Correlations.* Language, number work, nature, home interests.
VIII. *Cost.* 1c or less.
IX. *Sketches.* Teacher's sketches or cuttings to illustrate, when necessary, certain obscure parts or facts or forms.
X. *Reading References.*

EXAMPLE 2.

Subject: Technical Manual Arts.
Paper and Cardboard Construction, Grade I.

I. *Group.* Mounting Folders.
II. *Processes.* Cf. Buxton and Curran, *Paper and Cardboard Construction*, p. 19.
III. *Method of Instruction.*
Develop the idea of need for folders; a means of caring for story cuttings, etc.
Demonstration of new processes in detail.
IV. *Projects.* Single-fold folder.
Double-fold.
Triple-fold.
V. *Tools.* Scissors; rule marked only in inches; pencil.
VI. *Materials.* Rough gray cover paper, 6x9; paste.
VII. *Correlations.*
Folder to hold expressional manual arts work in language, etc.
Number work.
VIII. *Cost.*
IX. *Sketches.* Single-fold, double-fold, triple-fold; dimensioned.
X. *References.* Buxton and Curran, *Paper and Cardboard Construction*, pp. 18, 19, etc.

8. **Daily Lesson Plan.** With the larger outline plan showing in a general way the proposed arrangement of sub-

ject-matter for a year or a number of years, and the intermediate plan showing the essential factors necessary for a proper preparation in the way of equipment, methods, correlations, etc., further detailing might seem unnecessary. Teaching experience, however, will make clear that it is necessary or at least advisable to prepare a daily lesson plan.

Slavish dependence upon form, it is true, makes for loss of vitality in teaching, just as in any other kind of endeavor. A certain preacher in a large city in the Mid-West once asked another preacher of the same city how it happened the second preacher always had good audiences while he himself did not. "I work diligently on my sermons," the first preacher said, "and carefully write them out in full. Why is it I cannot hold my audiences, and how do you manage to hold yours?" "You read your sermon?" the second preacher asked. "Yes." "Well," the second preacher said, "I can only state that I, too, carefully prepare my sermons, even to writing them out in full. However, I never take a manuscript into the pulpit. At most, I make use of only a few key words as notes to assist memory. These, I place in an inconspicuous place and follow them thru casual glances rather than thru direct examination. If I have any success, it must be due to this." It is so in teaching. Slavish dependence upon notes, outlines, and textbooks "killeth the spirit." On the other hand, the spirit is not likely to exercise itself very effectively unless careful preparation has been made beforehand.

The form which follows is one taken from the author's *Correlated Courses in Woodwork and Mechanical Drawing.* Lesson Outlines, p. 105. Any adequate understanding of it will necessitate reading pp. 68-70 of the same text.

(Woodworking Group V.)

Recitation:

How to proceed where there are two or more like parts?

The aim in handling the different tools in duplicate work? Illustrate.
How hold the hammer? Illustrate.
Nails—How made originally? Forged and cut?
How are wire nails made?
Two classes and three kinds of nails? Differences?
History or meaning of 10-penny, etc.?
How else are nails designated?

Preparation for Demonstration:
Assignment for Lesson 26 in *Essentials of Woodworking*, sections 67, 68, 69.

Demonstration:
Nailing position; withdrawing nails; setting nails.

Work:
Group V.

The immediate *problem* here is one of learning to nail, withdraw nails, set nails in order the better to construct a box. The *solution* is to be attained by (a) getting the pupils to refresh their minds thru a more or less formal review of some of the material developed in a lesson immediately preceding, which material is needed as a basis for the presentation of materials of the new lesson. (b) Thru suggestions contained in pictures and thru the reading of that portion of a text bearing upon this immediate problem, new ideas are presented and preparation is made for still another method of approach, namely, the demonstration. The demonstration presents to the mind of the boy thru the eyes, and, as the teacher explains, thru the ears, what he more or less imperfectly got thru the readings and pictures. The readings and demonstration give to the boy the benefit of race experience as it has to do with this particular problem and make it possible for him thereby to reduce chances for error to the lowest possible terms. (c) The boys next go to the benches and work out the instruction in proper "form" of nailing, etc., thru trial and error.

In the above mentioned lesson we might have considered

we had a complete lesson, namely, (1) the problem; (2) the solution; (3) the application. Most manual and industrial arts teachers make use of this type of lesson solely and consider their task completed upon the completion of a series of such lessons. It is better, however, that we consider such a lesson as incomplete as to the cycle making for the highest type of education. We may consider that we have steps (1) and (2)—the problem and its solution, the making of the particular box mentioned being merely a part of the solution, namely, execution as differentiated from information. Application, as conceived by Dewey, does not find a place in this particular lesson. Opportunity for applying the information and skill developed in the above lesson, to the working out of new and original situations based upon this instruction and experience must come in later lessons. As such, this lesson serves well to point out the significance of a statement previously made, that not every lesson needs be a completed whole, and that certain lessons for a rather extended period of time may be formulated looking for the completion of their cycle in the future. In this lesson we have emphasized instruction in conventional method of procedure; the activity consisted merely in trying to put the technical information into effect under the direction of the teacher; opportunity for creative effort based upon this instruction is postponed. There is a danger, of course, in too extended a postponement.

An examination of daily lesson outlines, such as can be found in other texts, will show that a number of forms are possible. The essential thing is not that the young teacher follow the form of any one person, but that he be made to see the necessity for some kind of a form such as will enable him to present his lessons from day to day with intelligence and understanding, not only each day's work, but each day's work with reference to preceding and succeeding days and the

year or years as a whole. Education implies progression; progression implies forethought.

9. Summary. Good teaching becomes of value just in proportion as the young teacher differentiates ideals, aims, and the details of preparation and presentation of subject-matter. Problems of organization of the larger blocks of subject-matter may well be left to organization and administration; problems of detailed subject-matter and of method of presentation belong to teaching of manual and industrial arts.

For purposes of analysis, the followers of Herbart divide a lesson into six parts: (1) preparation, (2) presentation, (3) comparison, (4) abstraction, (5) generalization, (6) verification or application. Preparation consists in having pupils recall to mind certain previous information and experience which information and experience are necessary as a means of connecting up new information and experience with which it is desired to acquaint the pupils. Presentation in technical manual arts and in industrial arts consists in conveying to the pupils new materials for assimilation as a basis for steps to follow. This is usually done by means of the demonstration. Comparison consists in the association of one set of experiences with another or other sets. Out of this comparison comes abstraction of the common element and this in turn is followed by generalization. Verification or application consists in taking such derived rules, principles and ideals, and utilizing them as a means of reducing the time of experimentation in the meeting of new situations where the common element is present.

The six formal steps are usually thought of as inductive in character. Not infrequently the teacher cannot or does not consider it advisable to wait for the children to make the comparisons, the abstractions, and the generalizations, but

tells them; in such cases the method is deductive for the pupils.

Not every lesson needs be inductive; there is a large place for the deductive type.

The method of the six steps of the followers of Herbart is open to certain objections philosophically. A better conception is that in which the instructive process is considered as "moving" and dynamic, rather than set or static. In this newer conception there is (1) the problem; (2) the solution; (3) the application. The young teacher, while he should plan no less carefully, should know that such planning is valuable, not as a cast iron mould into which the happenings of the lesson period are to be compressed, but rather as a means of clarifying his own mind that he may be the better prepared to take advantage of every opportunity which presents itself as an aid in expediting the solution of the problem under consideration by the class or group.

The instructive question rather than the directive statement should be used in the presentation of lesson materials. Such preliminary and instructive questions will be found aids in the maintenance of discipline.

Coordinate with the discussion of Method of Presentation are more detailed factors of organization, which to a certain extent depend upon method of presentation and vice versa. These are considered under what is designated, Intermediate Plan Form.

Teaching experience makes plain the advisability of preparing a daily lesson plan in addition to the yearly outline and the intermediate plan. Slavish dependence upon form makes for loss of vitalness in teaching, just as in other kinds of endeavor; it "killeth the spirit." On the other hand, the spirit is not likely to exercise itself very effectively unless careful preparation has been made beforehand. This is to

be accomplished in part thru the daily lesson plan. It is not essential that one particular form be adopted by all; it is essential that some form be used. Education implies progression; progression implies forethought.

Reference Reading:

McMurry: *The Method of the Recitation,* Chapters XII, XIV.
Dewey: *How We Think,* Chapter XV.
Charters: *Methods of Teaching,* Chapters XV, XIX.
Allen: *The Instructor, the Man and the Job,* Chapters IX, XXX.
Griffith: *Correlated Courses,* pp. 68-70, also note pp. 91-132.

Class Discussion:

1. Into what divisions will you plan your period given you for technical manual arts?
2. Do you consider it advisable to have such divisions in expressional manual arts, or manual arts as a means of teaching other subjects?
3. Why is it advisable to have one division each set aside for the lesson—recitation and demonstration?
4. What percent of the total time available may profitably be devoted to the lesson?
5. Do you understand that a demonstration is guided wholly by instructive statements or is there a place for the instructive question?
6. Give examples showing the same problem deductively presented and inductively presented.
7. If a textbook is in the possession of each boy, what would be gained and what lost by having a reading of the subject-matter relating to the demonstration before the demonstration is given?
8. If you were asked to choose a text would you prefer one treating of processes in general or in connection with particular projects? Why, or why not?
9. Of what practical value is a knowledge of the six formal steps? What objections are there to their full acceptance?
10. Develop a lesson plan after Professor Dewey's conception.
11. In what manner will the method of the lesson differ in industrial arts teaching in the industrial school where boys are expected to enter low-grade industrial activities, and in industrial schools where the boys have time to take extended courses looking toward highly-skilled and directorate positions?

CHAPTER XIII

CLASS MANAGEMENT—DISCIPLINE

1. Maintaining Order or Discipline a Matter of Instinct as Well as of Training. Not infrequently one hears the expression, "Teachers are born, not made." An examination of the elements of strength of teachers to whom such references are made will show that in the great majority of cases it is such teachers' ability to govern boys and girls evenly and well that has attracted attention, and an enumeration of such elements of strength and weakness will reveal most of them as inborn. Bagley mentions the following factors which enter into the making up of what we call favorable teaching personality, arranged in what he considers their order of importance: (1) address (manner of meeting people); (2) personal appearance; (3) optimism; (4) reserve (dignity); (5) enthusiasm; (6) fairness (objective attitude); (7) sincerity; (8) sympathy; (9) vitality (vigorous personality); (10) scholarship. The following factors making for unfavorable teaching personality are also mentioned: (1) hesitation; (2) manifestation of temper before the class; (3) tactlessness (failure to get pupils' point of view about trivial things; failure to utilize dormant tendencies; failure to "explain" to parents); (4) failure to institute definite order of procedure; (5) lack of "teaching voice" (shrill, high pitched; noisy; thin, feeble, with poor enunciation, monotonous delivery which puts to sleep.) While a teacher may, thru conscious control, modify unfavorable natural tendencies, he will never work so successfully nor so easily as one possessed of favorable natural tendencies.

2. Successful Discipline, to a Large Degree, the Result of Thoughtful Management. Successful discipline, other

things being equal, is, according to Thorndike, the result of (1) keeping each child occupied with work which holds the interest of the majority of the class at least; (2) maintaining standards which make the majority of the class feel that they have to apply themselves if they are to receive the awards which go to good students; (3) making use of friendly rivalry; (4) placing individual responsibility, as in individual assignment; (5) having a time schedule and working to it at full steam ahead until the period is up; (6) having the work progressive always.

3. The Law of Association Applicable to Control of Conduct. If a teacher wishes a pupil or pupils to react in a given manner to a given stimulus, he will see to it that conditions are so set that the desired reaction shall follow the given stimulus with frequency, recency, intensity, and resulting satisfaction. If an undesirable connection has been formed it is to be broken thru disuse, or substitution, or inhibition.

4. General Causes for an Unruly School. According to Bagley, the most frequent causes for an unruly school are: (1) harshness and unsympathetic treatment; (2) indulgence and weakness of control; (3) inadequate preparation and brief tenure of teachers.

5. Specific Problems of Control. Experience as supervisor of practice teaching in manual arts will serve to point out the futility of trying to deal in any extended way with specific problems of control, elements of strength and weakness vary so greatly in young teachers. The chief source of difficulty is not that young teachers do not know what factors make for success and what for failure, but that they lack in ideals or standards. The development of such ideals is a matter of time and association and cannot be handed out ready made. If students have been accustomed to college teachers, whom they respect, talking, while teaching, with

toothpick in hand, or hands thrust deep in trouser pockets, or cigarettes alight, they are likely, other things being equal, to have no higher standards when they go out to teach. There are a few things which most young teachers of technical manual arts may well be advised about. A number of these the author has treated in the assignment in *Correlated Courses in Woodwork and Mechanical Drawing,* pp. 65-68; the discussion of a few others follows:

In nearly every class there will be found the occasional fellow who does not choose to follow instructions, or to make desired connections. It is the part of wisdom, whenever it can be done, for the instructor to go quietly to such a one and attend to him without attracting the attention of the class; a softly spoken, kindly, but firm address is usually sufficient. If the challenge is an open one then the instructor, if he is wise, will single out the offending individual and treat him as an individual. Even where a number of pupils are guilty, singling out one is strongly advised. It does little good, ordinarily, to scold a class, or to scold a few thru scolding a class. The fact that there are other guilty ones does not in any way excuse the one called out. He may be given to understand that he is responsible for himself alone, and that the instructor will attend to the others in his own time and way. Boys quickly learn that in union there is strength. The wise teacher will do well to deal with each individually.

The almost universal resort of a young teacher in dealing with an offending pupil is to tell him to leave the room. Unless some provision has been made beforehand for the care of pupils so banished, the cure is worse than no attention at all. Pupils so banished to the halls soon find companionship or at least leisure time for play. Resulting satisfaction usually follows, for in most communities, the severest punishment falls short of counterbalancing the pleasure or

satisfaction which comes from class attention or notoriety and being sent to the hall with its leisure. A better plan is to have such an offending member seated at one side of the room where he cannot trouble his fellows, with nothing to do. After a short time at this "occupation" he will usually ask permission to return to his work; few boys can stand inactivity long. With such a request once made, the teacher can quickly determine whether the offender means business or not, and can act accordingly. This treatment is only for the occasional offender. If any considerable number offend, it is an indication in all probability that something is wrong with the teacher and his plans. Where reasonable interest abounds there is likely to be no problem of discipline for any considerable number.

A very common source of trouble for a beginning teacher is his lack of foresight in instructing his class to the effect that when he asks a question of the class no boy is to answer aloud until his name is called. Boys of grammar school age like nothing better than to confuse a young teacher who asks questions of a class without preliminary instruction, by each and all answering and continuing to answer, ever louder as other members repeat. The confusion becomes deafening and the young teacher finds himself helpless because unable to make himself heard in the hubbub he unwittingly started.

Children are quick to detect elements of strength and reserve power in a teacher. They seldom or never as a class take for granted the possession of such elements except as they are manifested thru trial. They are strangely alert and intelligent concerning the justness or unjustness of a teacher's rulings. They are strangely merciless toward a teacher showing signs of weakness and lack of character or reserve force. To maintain a proper balance between a freedom which will develop individual moral independence and a sense of social

justice and at the same time maintain restrictions that will prevent license and interference with the teaching and learning process, is no small problem. It is a problem which challenges the best of teachers. Withal, Thorndike's statement with reference to interest may with equal propriety be applied here: "Get the right thing done at any cost, but get it done with as little inhibition and strain as possible." Make use of authority, if necessary, but only as a last resort. At best, it is but a temporary measure to tide over until the pupil can be induced to want to do the right thing.

6. Summary. An examination of the elements of strength and weakness of teachers in the matter of class management will show that the great majority of these are inborn or instinctive. While a teacher may, thru conscious control, modify unfavorable tendencies, he will never work so successfully nor so easily as one possessed of favorable tendencies.

Success in maintaining discipline, other things being equal, is the result of thoughtful management.

The law of association applies to control of conduct. If a teacher wishes to have pupils react in a given manner to a given stimulus, he will see to it that conditions are so set that the desired reactions shall follow the given stimulus with frequency, recency, intensity, and resulting satisfaction. If an undesirable connection has been formed, it is to be broken up thru disuse, or substitution, or inhibition.

According to Bagley, the most frequent causes for an unruly school are (1) harshness and unsympathetic treatment; (2) indulgence and weakness of control; (3) inadequate preparation and a brief tenure of teachers.

With reference to specific problems of control, it may be said that it does little good to scold a class or to scold a few members thru scolding the class. Unless some provision has

been made for caring for pupils so dealt with, it is poor policy to send pupils to the corridors as a means of getting them out of the room. A wise teacher will not put questions to a class without having first instructed them not to reply until called upon individually after a question has been put.

It is well for the young teacher to remember that to properly maintain a balance between freedom which will develop individual moral independence and a sense of social justice and at the same time maintain restrictions that will prevent license and interference with the learning and teaching process, is no small problem. Make use of authority if necessary, but only as a last resort.

Reference Reading:

Thorndike: *Principles of Teaching,* pp. 179-187.
James: *Talks to Teachers,* Chapter XV.
Bagley: *School Discipline.*
Griffith: *Correlated Courses,* pp. 65-68.

Class Discussion:

1. Thorndike says, "The law of selective thinking applies to conduct." State this law and explain its practical significance.
2. State the law of suggestion as it applies to conduct, and explain its practical significance.
3. Successful discipline is to a large degree the result of thoughtful management. The secret of success, other things being equal, is the result of (1) keeping each child occupied with work which holds the interest, at least of the majority of the class; (2) maintaining standards which make the majority of the class feel that they have to apply themselves if they are to secure the rewards of a good student; (3) making use of friendly rivalry; (4) placing individual responsibility, as in individual assignment; (5) having a time schedule and working to it "at full steam ahead" until the period is up; (6) having the work progressive always.
   Make application to the manual arts indicating just how you expect to utilize each.
4. Bagley mentions the following as general causes of an unruly school: (1) harshness and unsympathetic treatment; (2) indulgence and weakness of control; (3) inadequate

preparation and brief tenure of teachers. Illustrate each in some specific manual arts teaching.

5. Many young teachers, when sorely pressed, will send an unruly pupil out of the room into the corridor. Would you? Discuss.
6. Pass judgment upon the rule so often found in elementary shops: "Talking is permissible so long as it does not interfere with the work."
7. Can you see any possible danger in the young teacher's putting questions to the class as a whole instead of to some individual?
8. What do you expect to use as a final means of inhibiting undesirable tendencies? (Suppose corporal punishment is absolutely forbidden.)
9. Which do you expect to employ, your authority as a teacher or the innate sense of honor upon the part of the pupils to get results compatible with good scholarship and good citizenship?
10. A shop tool is missed, would you make the class as a whole pay for it in case it cannot be found? (Collective reparation for collective offenses.)
11. Do you expect to find the rules in college applicable in grammar schools?

CHAPTER XIV

STANDARDS AND TESTS

1. Teacher Standards. Much work remains to be done before it can be said there is a scientific basis for teacher standards. The accompanying factors are considered by supervisors of Kansas City, Missouri, public schools in estimating the value of a teacher to the system. While the score card is made for teachers of all kinds of work, it ought to prove suggestive and helpful to the teacher of manual or industrial arts who cares to know what elements are being considered by his superiors. One who forms a habit of thinking of teaching efficiency in terms of the various factors which go to make up such efficiency will be much more likely to be correct in his judgment than one who depends upon snap judgment.

DETAILS OF RATING

I. Personal Equipment—
1. General appearance; 2. Voice; 3. Natural aptitude for teaching; 4. Accuracy; 5. Industry; 6. Enthusiasm and optimism; 7. Integrity and sincerity; 8. Promptness.

II. Social and Professional Equipment—
9. Courtesy to associates, pupils and patrons; 10. Understanding of children; 11. Ability to meet and interest patrons; 12. Interest in lives of pupils; 13. Cooperation and loyalty; 14 Professional interest and growth; 15 Daily preparation; 16. Use of English; 17. Accuracy of knowledge; 18. Breadth of scholarship.

III. Administrative Technic—
19. Care of light, heat and ventilation; 20. Neatness of room; 21. Discipline and governing skill; 22. Initiative and Self-reliance; 23. Adaptability and resourcefulness; 24. Self-control; 25. Tact; 26. Sense of justice; 27. Economy of time.

IV. Teaching Technic—
28. Definiteness and clearness of aim; 29. Skill in habit formation; 30. Skill in stimulating thought; 31. Skill in teaching how to study; 32. Skill in questioning; 33. Choice of subject-matter; 34. Organization of subject-matter;

35. Care in the assignment of lessons; 36. Skill in motivating work; 37. Attention to individual needs.

V. Results—
38. Attention and response of class; 39. Growth of pupils in subject matter; 40. General development of pupils; 41. General influence.

2. Standards of Pupil Accomplishment in Manual Arts by Grades. The following very excellent charting of handwork accomplishment by grades appears in *Handwork in Religious Education* by Addie Grace Wardle, and is reproduced here by permission of The University of Chicago Press. It should be studied in connection with the Outline for Grades I to VI, Outlines in Teaching Manual Arts, Appendix II.

KINDERGARTEN:

(a) Interest:
1. Handling of material.
2. Changing forms as accompaniment of pupil's changing thought.
3. Imagination basal.
4. Nothing intermediate between idea and result.

(b) Ability to be Cultivated.
1. Free constructive ability.
2. Not imposed plans, not value attached to results.
3. Thinking naturally in art expression—tendency to express in symbols as well as in words.
4. Knowledge of simple forms and recognition of their representation.
5. Recognition of simple colors and their use for blocking in representation.

(c) Work to be Given.
1. Free drawing with pencil—suggestions but not patterns —and free construction work.
2. Crayola—rubbed surfaces out of which figures are cut.
3. Coloring with crayolas within drawn patterns.
4. Coloring prints.
5. Simple water-color washes.
6. Mounting of pictures.
7. Border designs—simple.
8. Simple paper cuttings and tearings.

GRADES I-II

(a) Interest same as above. A little additional value attached to results.

(b) Ability to be cultivated:
Readiness to illustrate ideas, however crudely—drawing used as a language.

(c) Work to be Given.
1. Rapid use (molding) of materials, such as sand and clay.
2. Border designs as frames, pictures and paper-cutting.
3. Simple pictures for crayola, blackboard, and water-color work.
4. Collections of colors, flowers, papers, etc.
5. Paper-cutting and tearing and their mounting.
6. Simple paper folding.
7. Beginning of work in wood and reed.

GRADES III-V

(a) Interest:
1. Not satisfied with transformation of material by imagination.
2. Results become important; permanency and use important.
3. Intermediate means of attaining results, the object of attention.
4. Organized activity (age of organized play).
5. Larger use of tools—skill in use a matter of concern.
6. Desire to represent truthfully and to picture different effects.

(b) Ability to be cultivated:
1. Use of patterns, designs—to shape materials as predetermined.
2. Care and skill in use of tools—ability to express a given thought with increasing completeness.
3. Some intellectual control—thinking things out ahead.
4. Discrimination of colors.
5. Correct judgment of general proportions by the eye rather than by measurements.

(c) Work to be given:
1. Simple geometric relations of vertical, horizontal, and parallel as involved in simple drawings.
2. Rhythmic arrangement in border and surface patterns.
3. Pleasing arrangements within enclosed spaces, etc.
4. Bilateral symmetry and its methods.
5. Collection of samples for color groups. Discrimination in sorting colors.
6. Arranging colors.
   a. Complementary color schemes.
   b. Value schemes.
7. Appearance of objects in different positions.
8. Modification of natural forms for designs.
9. Interpretative images (type forms).
   a. Geometric relations.
   b. Animal forms.
   c. Plant forms.
   d. Forms of rectilinear and curvilinear construction.
10. Simple map constructions.

11. Coping-saw work.
12. More difficult construction work.
13. Beginning of written work creation.

GRADES VI-VIII

(a) Interest:
1. Sustained purpose—a final end.
2. Accuracy according to pattern or idea, conformity to reality.
3. Interest in real life, deflection from school.
4. Sympathetic interest in art activities of others—historical and practical.

(b) Ability to be cultivated:
1. Use of drawing as a means of explanation and description.
2. Clear, visual patterns.
3. Orthographic reading.
4. Rapid sketching.
5. Accurate scientific sketching.
6. Good taste in beauty of form and harmony of color.
7. Knowledge of art history and art as a vocation.

(c) Work to be given:
1. Geographical drawings and map modelings.
2. Flower and plant shadow pictures for foreshortening and delicacy.
3. Blueprints (for nature study).
4. Different arrangement of leaf, flower, or object drawn.
5. Matching in water-colors the colors of plants, etc.
6. Balancing in design, also more bilateral symmetry.
7. Appreciation of demands and limitations of decorative work.
8. Perfect matching of color by mixing of water-colors.
9. Development of intensity color schemes.
10. Representation of moods of nature effects.
11. "Rapid descriptive sketches, well constructed drawings, truthful records of observations."
12. Completed pictures in pencil, crayon, or water-color.
13. Careful constructional work.
14. Advanced work in the crafts: bookbinding, woodwork, reed and raffia work.
15. Landscape sand modeling.

3. Specific Standards and Tests. No small amount of work has been done in academic work, along certain lines in an effort to provide a more scientific basis for evaluating pupil work. Scales of more or less value have been worked out for such subjects as composition, handwriting, number work. In manual arts little has been done toward setting

up uniform objective standards; each teacher has been a law unto himself, marking pupil work as his feelings dictated. It is highly probable that no perfectly objective set of standards of universal application can be secured. It is possible, however, to do something toward setting up certain standards, and an attempt will be made herewith to point out a method of attack which any teacher may use in his efforts to inject a little more science into his system, or lack of system of marking. In Chapter II, manual arts was differentiated into (1) expressional or motor expression, (2) technical or motor education. Technical manual arts or motor education was subdivided into considerations of form and technic, and execution and skill. The distinguishing characteristic of motor expression was said to be spontaneity, that of form and technic was said to be instruction, while execution and skill were said to be characterized by trial and error. A third division of the manual arts might have been made, as motor expression based upon motor education, the characteristic of which would be creative effort based upon knowledge and skill.

The subject of standards and tests in motor expression or expressional manual arts may be dismissed with the statement that the pupil has done all that is to be expected in any given piece of expressional work when the idea or ideas to be expressed are clearly evident to other members of the class and when the pupil has exercised such technical skill as is needed for the purpose in hand. Evaluation of technical skill in expressional work will have to be determined in the light of the amount of technical training the pupil has had up to the time of the given expressional lesson. For example, let it be a fifth grade problem in "Sketches to Illustrate History, Stories of the Romans," Appendix II. Certainly, such sketches, while illustrative, should not only convey the ideas intended with clearness and exactitude, but should also show

a technical superiority over those of first grade in proportion to the amount or degree of technical instruction in drawing and representation.

4. Standards for Form and Technic. Form and technic have to do with ideas and with instruction. The woodworker has a certain order of procedure in squaring-up a piece of stock, in laying out and making a mortise-and-tenon joint, etc. These methods of procedure are not arbitrary but are the results of race experiences in working wood wherein methods which reduce possible chances for error to a minimum have been evolved. Good form and technic represent the science of an activity, and have their basis in reason.

What shall determine standards for form and technic in any line of endeavor? Evidently an analysis of trade practice itself will give us such standards. Formerly, much of the form of the trades could be obtained only by word of mouth. Today much good work has been done and is being done in the matter of recording in book form the form of the various trades. Any good text, then, dealing with the principles of working the materials of a craft will provide proper standards for form as it has to do with that craft.

There remains the determining of certain minimal essentials for each grade for each kind or type of school. What, for example, may we reasonably expect a boy to know about the principles of working wood after a year in the 7th grade with 2½ hours a week devoted to systematic working of wood? An examination of the Lesson Outlines, *Correlated Courses,* pp. 91-132, will indicate what one teacher thinks pupils may reasonably be expected to know after certain hours spent in certain grades upon certain kinds of work.

5. Tests for Form and Technic. Since form has to do with ideas, in so far as relation of teacher to pupil is concerned, the oral and written quiz with final examination pro-

vide a test for form. The recitation, discussed in Chapter XII, is merely a testing of recollection of form thru the oral quiz.

The reasons shop men neglect to test form are two—first, they fail to appreciate the need for having pupils hold in memory knowledge of correct form, and, second, the shop time is so short they dislike to utilize any of it for mental

WOODWORK 1a

Quiz No. 2. Name.....
1. Large squares of one piece of steel are called.....
..... The long arm is called the.....
and the short arm the.....
2. Dividers are used for (1).....
(2)..... (3).....
3. Pencil lines are easiest removed from wood by means of.....
....should never be
sandpapered.
4. Four steps in putting a saw in order are (1).....
..... (2).....
(3)..... (4).....
5. In all duplicate work the aim of the worker should be.....
.....before laying it down and taking
up another.
6. A wire gage for nails differs from a screw gage in that.....
....
7. Some of the parts to a lathe are (1).....(2).....
(3)..... (4)..... (5)..... (6).....
(7)..... (8)..... (9)..... (10).....
(11)..... (12)..... (13)..... (14).....
All shearing cuts in turning depend for success upon keeping the
bevel or grind.....to the surface cut.

Fig. 24. Blank Quiz.

tests. The argument for having pupils "keep the memory processes open" as regards form and technic will be presented in the chapter following. Fig. 24 is an example of a blank quiz, the use of which makes the element of time utilized for testing form a negligible one. Such quizes are made out by the teacher in multigraphed form. The student has merely to fill in the appropriate word or words. The exact words of the text are not demanded, but only such words as convey the proper meaning. Such tests can be completed in not to exceed five minutes. Pupils who cannot complete them in a

reasonable time should be required to hand them in anyway. Not infrequently the time required to answer is indicated upon each paper and the paper weighted somewhat accordingly. A second advantage of the blank quiz lies in the ease with which it can be graded. The teacher merely marks the errors, counts them and the number so resulting serves to rank the student among his fellows.

Such tests should not be mistaken for other than tests of memory, or recollection of form. A second test, a test for technic, which is form in use, should consist of observation at stated intervals of the manner in which students apply this knowledge in execution. It is possible that so high a correlation exists between application of proper form, or technic, and excellence of material result that such observational tests may safely be omitted. Teaching experience seems to indicate the advisability of such observational tests, especially with the younger pupils.

6. Standards and Tests for Skill in Execution. The factors which enter into the making of excellence in execution are many. So many, in fact that the only hope of constructing a workable set of standards and tests lies in the ability to discover correlations between factors such that the number may be reduced to a reasonable set. The factors most commonly considered are (1) speed, (2) accuracy, (3) neatness. Only in the most general and unscientific way have standards been set for any of these factors for various grades of various kinds of schools. It may be that it is not possible or desirable to reduce manual arts to the necessity of meeting the demands of standards and tests of a scientific character. Certainly there is need for more uniformity as to standards and tests than now exists in manual arts teaching.

Standards for time exist in practically all kinds of trade work. Any hand-book on cost data will give standard time

allowances for various kinds of work. For example, a carpenter is expected, standard time, to place 1000 ft. of 2″x4″ wall studs in 32 hrs.; 1000 shingles on plain roof in 3½ hrs., etc. Some men will place more, some less, but a reasonable time allowance is as given. Evidently, the tool for testing time is the watch or clock. This is what is known as an objective test; it is a matter of fact, not of opinion.

Accuracy or skill in execution in the trades, we are told, must be 100% perfect. That is, a printer is not excused because he has allowed only one misspelled word to creep into the final form of the book. Of course, among the different trades there are variations in requirements. Carpenters are not supposed to be satisfied with a joint unless it fits snugly at all points. A machinist may be required to work within the 1/1000 of an inch, a carpenter never. This 100% perfection, then, is relative. What is meant is not absolute perfection of standards, but perfection of attainment which approximates closely standards set in the trades. Tests usually applied in woodwork are for accuracy of dimensions—length, width, thickness; for squareness; for straightness. Tests for dimensions will be made with the rule, tests for squareness with the try-square, tests for straightness with a straight-edge for objective test and by sighting with the eye for subjective test.

Neatness is more difficult to measure. The eye alone is used to determine the general appearance of a project, whether plane marks are left on surfaces, whether arrises are kept sharp and clean, whether corners are split, etc. Only as the eye, or the mind back of the eye, is trained to recognize certain standards of excellence is the test of value.

Such personal elements as (1) attitude, (2) attention, (3) industry, are usually taken into account in grading a pupil for the month—they should not be considered in evaluating a given piece of work for neatness, speed and accuracy. Atti-

tude, attention, industry, like neatness, are subjective, depending upon the ideals the individual teacher may have as to these matters.

7. Illustration of a Method of Attack in Establishing Pupil Standards for Accuracy in Execution in a Given Specific Project. A mechanic may be held to 100% efficiency in accuracy or skill in execution and time for accomplishment. In manual and industrial arts, some allowances should be made for the fact that the student is a beginner and not a mechanic. It may be found advisable, for example, on the first piece of woodwork to demand 100% accuracy in squareness only, centering the attention upon this with the understanding upon the part of the pupil that dimensions are to be made as large as possible, consistent with the 100% attainment in squareness. The element of speed may be neglected except in a very general way—a maximum time allowance may be made, after which the class is to move on, or be given a demonstration upon new subject-matter.

The following example* will serve to illustrate a non-technical method of attack in setting standards. As it is based upon only 66 student participants the results are not to be taken as absolute, even for the class of students specified. At least 1000 cases should be examined to give the results that are reliable. Sixty-six college freshmen, never having had any woodwork, were each given a board 6″x12″, surfaced on two sides to ¾″ in thickness. After a careful demonstration they were asked to plane the two edges straight, square to a selected and marked face-side, and parallel one to the other. They were told no board would be accepted by the instructor until there was 100% efficiency of attainment in these respects—that is, until the instructor could detect no light between try-square and edge and no variation in

*Data arranged by L. R. Fuller, sometime Assistant in Manual Arts, University of Missouri.

width of board with the sliding try-square test. They were also told to take off no more shavings than absolutely necessary to secure the required result, that the student with the fewest shavings removed would rank highest

The results tabulated were as follows:

Amount removed from width in 16ths of an inch:

2/16	— 2 cases.	12	— 1 cases.
3	— 8	13	— 0
4	—16	14	— 6
5	—11	15	— 1
6	— 6	16	— 0
7	— 0	20	— 1
8	— 6	28	— 1
9	— 3	31	— 1
10	— 2	46	— 1
11	— 0		

Now, according to the Law of Probability, of Chapter VII, the distribution of these amounts according to the number of students involved will be as follows:

2% used 2/16″ of board or less
23% " 2/16 to 4/16″ of board
50% " 4/16 to 7/16″ " "
23% " 7/16 to 1 7/8″ " "
2% " over 1 7/8 " "

For the sake of convenience in combining rankings in several factors, we may arbitrarily assign certain numerical scores to each of these ranks as follows:

Standards for scoring width of first exercise.
2/16″ or less =Score 1.
2/16″ to 4/16″=Score 2.
4/16″ to 7/16″=Score 3.
7/16″ to 1 7/8″=Score 4.
over 1 7/8″=Score 5.

In a similar manner, these students were instructed to make the two ends square to the face-edge and face-side taking off no more stock than was necessary to secure 100% accuracy in squareness. A careful demonstration was given, and the instructor accepted no piece until it failed to show any light between end of the board and the try-square blade.

The results were as follows.

Amount removed from length in 16ths of an inch:

1/16	— 2 cases	9	— 5 cases
2	— 2	10	— 5
3	— 2	11	— 5
4	— 5	12	— 5
5	— 2	16	— 1
6	—18	18	— 2
7	— 7	24	— 1
8	— 4		

Distributing these length variations according to the Law of Probability the result is as follows:

2%	used	1/16″ of board or less
23%	"	1/16 to 3/8″ of board
50%	"	3/8 to 5/8″ of board
23%	"	5/8 to 1 1/8″ of board
2%	"	over 1 1/8″ of board

Assigning numerical score values we have

Standards for Scoring Length in first exercise.

1/16″ or less =Score 1.
1/16″ to 3/8″=Score 2.
3/8″ to 5/8″=Score 3.
5/8″ to 1 1/8″=Score 4.
Over 1 1/8″=Score 5.

In a similar manner other factors such as time, neatness, etc., may be scored.

These scorings for each student may next be combined and the result will give each his ranking among his fellows. If an average is struck after combining, grades may be assigned as follows:

1=Excellent.
2=Superior.
3=Medium.
4=Inferior.
5=Failure.

Once having determined an objective set of standards for a sufficiently large number of individuals to exclude serious

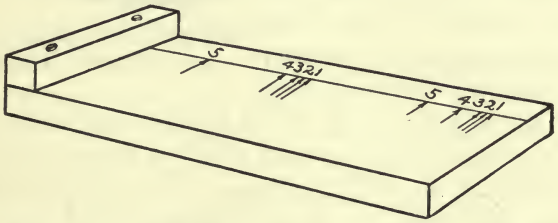


Fig. 25. Scoring Device for Woodwork Dimensions.

effects from accidentals, a scoring device similar to that of Fig. 25 might be constructed for certain test problems to be given at stated intervals on predetermined types of work. This device is for scoring width of board in edge planing and length in end planing in the problem for which standards were just developed. The various boards of any class are merely laid upon the table, one edge or end against the stop and the proper score is read at the other edge or end.

Fig. 26 shows a type of limit gage for commercial testing of commercial metal machine work. There are two limits, a maximum and a minimum. The piece of work to be tested must pass thru one but not the other. There is no reason the school shop should not possess and make use of the gages

used in the trades. Industry has objective standards for nearly everything—especially in manufacture. Industrial arts teaching must ever keep in mind such standards since the development of efficiency is the end and aim of all industrial arts teaching.

Fig. 26. Limit Gage for Testing Machine Products.

Manual arts teachers too often have few standards or tests other than those derived from their feelings in the matter. With large classes and full teaching schedule they find little time or interest in developing more scientific standards and tests. The very least any young teacher can do is to make many visits to other shops in an effort to educate his feelings as they have to do with standards. The second thing is to set about developing a set of standards and tests which may be applied semi-occasionally, just as the blank quiz test is applied semi-occasionally. With enough teachers working together upon such similar tests, some sort of a standard for speed and accuracy in various types of work ought to result that will make for more just grading. The teacher's first duty is to teach, of course; a teacher with proper information as to what pupils of a certain grade may reasonably be expected to accomplish will teach better than one who has no such conception.

8. Summary. Much work needs be done before it can be said that there is a scientific basis for teacher standards. Not a few cities have determined upon certain factors to be considered in attempts to evaluate teachers of their system for purposes of promotion. Manual and industrial arts

teachers may be benefited by making a study of these factors

Only in a very general way have standards of subject-matter requirements for different grades in different types of schools been set.

In matters of standards and tests for pupil accomplishment within any given type of work, it may be said that the factors to be considered are, in a large part, those enumerated in Chapter II. In expressional manual arts, we may dismiss the subject with the statement that the pupil has done all that is to be expected in any given piece of work when the idea or ideas to be expressed are clearly evident to other members of the class and when the pupil has made use of such technical skill as is required for the purpose.

Technical manual arts and industrial arts will consider form and execution as factors making for standards of pupil accomplishment. Form has to do with ideas and with the assimilation of instruction in conventional methods of procedure. Analyses of trade practice will provide standards for proper form. Such analyses can be found in reputable texts dealing with the conventions of the craft under consideration. There remains the determination of certain minimal essentials of subject-matter requirements for each grade in each type of school.

The oral and written quiz with final examination provide a means of testing form. Tests for technic, which is form in use, will have to be made by the teacher's observing the pupils at work. Shop men neglect the testing of form and technic, as a rule, because they fail to appreciate the need for having pupils hold in memory knowledge of correct form; also, because they hesitate to reduce the already brief shop time by taking time for mental tests, even where these have to do with the subject-matter of the shop.

The factors most commonly considered in testing for skill

in execution are speed, accuracy, neatness. Standards for time exist in practically all kinds of trade work. The means for testing time is, of course, the clock or watch. Trades claim to be satisfied with nothing less than 100% perfection. This does not mean absolute perfection of standard, for standards in trades are relative; it means only that nothing less than well-recognized minimum trade standards is acceptable.

A mechanic may well be held to 100% efficiency, on the basis of trade standards, in both speed and accuracy in execution. In manual and industrial arts some allowances must be made for the fact that the student is engaged in the learning process. Instruction and speed attainment conflict. In presenting new subject-matter we may choose to emphasize accuracy or we may choose to emphasize speed, or we may balance the emphasis with a consequent falling off of efficiency in either. Schools, conducted properly, that is, with attention to learning as well as developing speed, cannot hope to compete with industry wherein the workmen have ceased to learn, but have all their time and attention for speed attainment. From such studies of student speed and accuracy, neatness, etc., wherein large numbers are considered, ever looking to trade standards as ideals, it will be possible to establish reasonable standards of attainments for students at various stages of their development in both speed and accuracy. Human elements, too, such as attitude, attention, industry, should be taken into account in grading pupils for reward but not for grading product.

Reference Reading:

Sargent: *Fine and Industrial Arts for Elementary Schools.* pp. 21-25, 44-46, 77, 79, 128.

Collins: *Drawing and Constructive Work for Elementary Schools,* pp. 75, 80, 85, 90, 94, 100, 102, 104, 106, 107.

Leavitt: *Examples of Industrial Education,* pp. 191-200.

U. S. Army: *Trade Specifications and Index.*
U. S. Army: *The Rating Scale, Personnel Work in the United State Army,* 1919.

Class Discussion:

1. State as concisely as possible just what subject-matter you think might well be considered as standard for primary grades, intermediate, upper grammar, and high school.
2. Making use of the Kansas City "plan for measuring merit or efficiency of teachers," score a number of manual or industrial arts teachers. If possible, visit and make yourself acquainted with the work of the drawing and manual or industrial arts teachers of the public schools.
3. As yet, no one has worked out a set of objective scales or tests or standards for manual arts, as has been done for handwriting and composition in academic work. Every opportunity should be taken to find out how teachers of good reputation professionally are grading.

CHAPTER XV

CONDITIONS WHICH MAKE FOR PROGRESS

1. Conflicting Aims in Education. A careful reading of the discussion of previous chapters of the book should have pointed the fact that education is confronted with many conflicting aims and ends and that what may be gained by over emphasis upon one line is counter-balanced by a loss along another line. When we stress instinct we neglect intelligence, and vice versa. Theory, science, the general, knowledge, technic, form are opposed to practice, the art, the specific, doing, skill, execution. Referring to Fig. 1, the former have to do with connections between thought and thought, connections No. 3, Path No. 2. The latter have to do with either Path No. 1 or Path No. 3. Either of these latter connections tends to interfere with connections No. 3 of Path No. 2. The general vs. the specific has been sufficiently discussed in Chapter VIII, Correlation and Association. Intellect vs. feeling has been discussed in Chapter I. Technic vs. skill will be found discussed in Chapter II. Other conflicting aims have also been treated; space will be taken in this chapter merely to point out some conditions which must obtain in manual and industrial arts if progress is to be made.

2. Manual and Industrial Arts an Attempt to Provide a Better Balance Between the Abstract and the Concrete in Education—Between Theory and Practice. Fig. 27 shows graphically the distribution of people in the state of Missouri engaged in the larger pursuits. From this it will readily be seen that by far the greater part of her people are engaged in the manipulation of concrete things rather than abstract ideas. To neglect in our schools the giving of opportunity for technical experience and expression thru the

manipulation of concrete materials is to ignore the welfare of that vast majority of our people who will live by the manipulation of materials. "Improvement in one special power rarely, if ever, means equal improvement in general." Years of training in generalizations based upon haphazard concrete experiences will not help much when, in after life, the boy

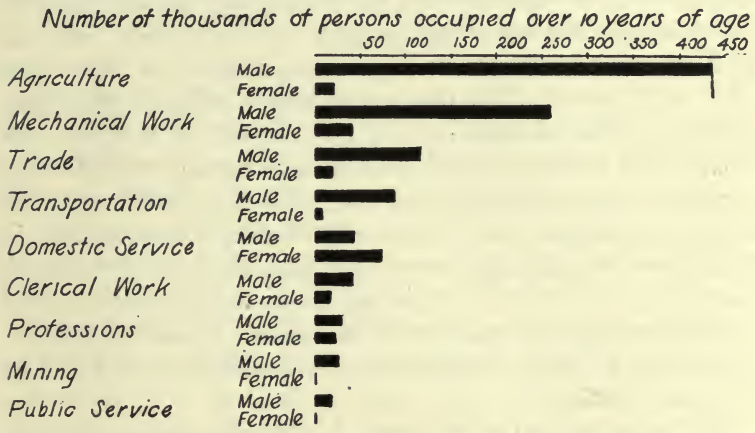


Fig. 27. Distribution of Persons Engaged in Gainful Occupations in the State of Missouri, Census Report, 1910.

or girl is brought face to face with the necessity for quick decision accompanied by prompt execution in a world of concretes. Indeed, such discipline may even prove a hindrance thru having developed an attitude of mind which requires much time to consider all of the niceties involved in the passing of judgment upon derived abstractions, abstractions interesting in themselves but of less moment at the time than the prompt execution of the task in hand.

A paragraph from an article in the *Medical Review of Reviews*, September, 1915, reads: "Attentive control—the power of fixing the attention on one thing and then doing it to the exclusion of all others—is 'the one aim of true educa-

tion,' yet its loss is increasing at an alarming rate. We find more and more people who are victims of indecision, who cannot make up their minds." If school life is to be devoted exclusively to generalities, to abstractions, and "mental capacity depends upon the concrete data with which it works," need we be surprised to find indecision when the product of the school is brought face to face with the realities, with the necessity for dealing with concretes? "To learn by doing is to learn with the best aids psychology and science have been able to discover." The remedy for a race afflicted with indecision is a liberal introduction of subject-matter which will give to the children plenty of specific experiences with such concretes as may be found in the practical subjects. If such school experience should do no more than continue the respect, interest, and pleasure which little children have in the manipulation of concrete materials, it would have better served the 95 per cent who must make their living by such manipulations than to have made them feel that theirs was a life of enforced drudgery.

All industrial pursuits depend for success upon a recognition and understanding of certain conventional methods of procedure coupled with an unconscious tendency to act, once the recognition of what comes next enters the field of consciousness, or is suggested thru reflex muscular control or feeling. The data of the practical subjects, habits of mind and body, the attitudes, are to be got only thru experiences with the data and methods of procedure common to such subjects. Accuracy of judgment developed in a study of formal logic is of little aid when judgment of a practical nature based upon experience with specific practical data is demanded. Every child should have some experience along one or more practical or technical lines of endeavor. The greater the number of lines available for choice the better, provided they are well organized and well taught.

The author would be false to the subject did he not again call attention to the fact that, while most academic subject-matter deals too exclusively in generalities to supply a complete educational experience, manual training, as now taught by many with little or no qualifications for teaching the subject, often deals too exclusively with the details of industrial experience. If manual training and industrial arts are to take the large place in the educational field which awaits them, they must so organize and teach their subject-matter that details of specific experiences shall be seen by the pupil in their larger relationships. Manual training and industrial arts teachers must remember that their subject is to be justified not alone by similarity of subject-matter and similarity of method of procedure but also by the extent to which it enables students to formulate these specific experiences in terms of general principles and ideals.

3. Need for a Scientific Treatment of Subject-matter. The man of so-called practical training too often is inclined to ridicule the efforts of the man engaged in making a study of the science underlying such practical activities. A few examples will serve to illustrate the need for scientific treatment of subject-matter. The following on "Tone Placement" is from a metropolitan daily: "Recently I heard a distinguished singer. At first the voice seemed to have quite an unusual color. It seemed more like an instrument than a human voice. Little by little I became accustomed to the quality, and finally began to like it. I wish to speak of the placement of this voice. The best tones were of a medium quality and volume and quite satisfactory. But they were placed by Nature. I could tell that, because, if they had been acquired by the study of tone placing the singer would have employed her knowledge of tone placing on her high tones and would have been equally successful in producing a good high tone—at least a good F or G, which were, I believe, the

tones she sang in a somewhat hit-or-miss manner. This uncertainty—hit or miss—was apparent in all her songs. Now, if this singer had known exactly how she was taking her good middle tones, she would sing the high ones successfully. If she would focus her breath above the upper front teeth and the roof of the mouth, she would produce a good tone every time. I am sure of this, because she gets a good tone sometimes. She would then guide her breath up and let it float out of an open throat—open above the larynx. If a tone sounds veiled, that is a sure sign it is not properly produced. Placing a tone means that the vocalized breath must be carried up against the roof of the mouth. In this way resonance will be secured and clarity, the veiled sound disappearing."

Again, a carpenter of ten years experience presented himself for an examination in carpentry. He was given a piece of 2″x4″ and told to frame the side-cut for an octagon jack. Altho he could frame the side-cut for a jack on a square corner he was non-plussed when asked to frame the same cut on an octagon jack. Now, as a matter of fact, the carpenter who can frame an octagon jack side-cut, except by cut-and-try method is rare. Why? Not because the cut is a difficult one to make—it is no more difficult than the same cut for a square corner jack—but simply because he has not mastered the science of roof framing. He has been taught to think in terms of a certain specific type of roof, and the specific numbers to be used in framing that type rather than to think in terms of principles.

These specific experiences are the necessary basis for the science or theory of an art but they do not in themselves constitute science. Only as these specific experiences are generalized do they take the form of science. Science emphasizes selected experiences, Cf. Chapter X.

Much so-called new manual training and industrial arts,

with its stressing of subject-matter only, is likely to cause a distinct educational loss thru its emphasis upon mere association rather than upon additional selection. The so-called practical manual arts and industrial arts which take the form of chores about the home, repair work about the school, building of school equipment without due regard to proper principles underlying the activities, mere emphasis upon what to do with little upon why it is done that way, is of limited educational value.

4. **Limitations Which Arise from Undue Emphasis upon Theory or Science.** If the practically trained man has his weaknesses, the scientifically trained man, with no basis for his science or theory in practical experience, is also subject to serious handicap. This is the greatest cause for weakness in our academic system of education as it is constituted today. Educators, recognizing as they do the great value of theory, science, take little children and from first grade thru university, strive to stuff them with principles, rules, theory, science, abstraction. Eight years of grammar school, four years of high school, four years of college, and possibly three more years of graduate work—all devoted to an attempt to master rules, principles, science, is a rather wasteful process. Lacking a suitable basis in practical experience, the thinking becomes one of memory, of association rather than reason or selection, to a large extent. An examination upon subject-matter covered will prove that only a very small part of that studied is remembered to the end of the preparatory period. Even if all the rules and principles were remembered and understood there would still remain the necessity for education thru feeling which we have tried to point out is no small part of a complete education. A boy may be taught all the science of riding a bicycle or of flying the aeroplane; only as he has opportunity for forming the necessary muscular adjustments thru riding the bicycle or flying the aeroplane

can we say that his education in these respects is complete.

Science, technic, form, cannot in any way serve as a substitute for trial and error in execution; what it can do is to reduce the number of trials thru reducing the chances for error to the lowest possible number and providing the connecting link so that one set of specific experiences may function in another set, in so far as reduction of chances for error is concerned. The carpenter who knows how to frame a side-cut for a jack of a square corner roof, will not be nonplussed when asked to frame a side-cut for an octagon jack if he knows the science of roof framing. A pupil who has merely studied roof framing principles, without applications of any kind will find himself non-plussed when he tries to frame an octagon jack, in a way the carpenter is not. All the science in the world about roof framing will not make it possible for the student to frame an octagon jack without the same trials and errors for muscular adjustment that the carpenter experienced in his earlier days.

Theory or science, then, is of value only when applied. Too long continued attention to theory without application makes for lack of meaning in theory. Both theory and application alternating at not too infrequent periods are necessary to a vital educational experience.

5. The Place of Texts. Not a few manual and industrial arts teachers, taking their cue from certain so-called practical men of the trades, ridicule the use of texts in shop classes. Manual training and industrial arts, they say, are in the schools as a protest against a bookish education. If academic education has over-emphasized a study of rules, principles, theory, manual and industrial arts will not better the situation by going to the opposite extreme and emphasizing feeling or direct interpretation to the exclusion of attention to the science underlying the subject-matter with which they are dealing.

Texts in manual arts are of two kinds: (1) Those which deal with the principles of working the materials of any given craft not as principles but as specific directions in connection with some specific project or projects. The principles of squaring-up stock, for example, are not treated as such but are treated as steps in making a specific project, as a taboret. (2) Those which deal with principles only, projects and the project operation sheets being given on a separate form. It should be recognized that a treatment of subject-matter which fails to dissociate principles from specific projects is of less value in certain ways than one which causes the pupil to think in terms of principles so dissociated. A pupil who follows specific project directions is doing associative thinking not selective. While he will or may succeed on a given project better than one whose directions are to be got from general principles, he will most likely be non-plussed when a different project with similar principles involved is presented him.

"Language, written and spoken, serves to connect theory and practice." A properly written text is a good teacher's tool for the economical connecting of theory and practice. Only as the memory processes are kept open is it possible to make theory function in practice. Only as the memory processes are kept open is it possible to effectively adjust one's self to new situations thru knowledge. Textbooks dealing with principles afford a tool whereby the individual may keep memory processes open thru study and review.

6. Race Progress Demands that a Balance be Maintained Between Conflicting Aims. The complete educational experience involves experience with specific concretes; out of these experiences thru contradictions should come abstraction and generalizations in the form of rules, principles, theory, and science. The third step consists in the application of these rules, this science or theory to new situations.

Race progress demands that a balance be maintained between conflicting aims, such as theory and practice, etc.

As in the discussions of previous chapters, so in this, what has been said must be taken as the result of an approach from the psychological or individualistic point of view. There is still to be considered the social and economic and ethical approaches.

Social and economic considerations necessitate the further statement that maintenance of balance in conflict of aims making for race progress does not depend upon the maintenance of balance of these factors in individuals. In fact, race progress appears to be most favored when individuals and classes do not maintain balance but specialize. Some men may become the thinkers, some doers in the world's work. In the long run, however, there must be a balancing of individual or class specialist of one type against individual or class specialist of opposite type—not in numbers but in the meeting of social need. Social and economic considerations, then, afford the basis for justification for the education of types not recognized as wholly or highly desirable from the standpoint of psychology or of the individual. It is on this latter basis that we allow and encourage the training for the three types of reactive needs—the common laboring, the skilled, the director.

In the recognition of the place of these three types of reactive needs in education and in the granting of the justness of differentiation in awards on the basis of educational investment, it should not be taken for granted that the present situation as to the relative amounts of awards is approved. Undoubtedly members of the laboring class, in most communities, are not receiving a just share comparatively. A section hand who labors ten hours a day, on work that must needs be done, at a rate of one dollar and seventy-five cents a day, certainly is not getting a fair share from railroad re-

turns in which the president is paid one hundred thousand dollars per year. The section hand usually has the larger family, and human needs as to food and clothing, medicines, etc., have a minimum limit below which they cannot go without causing harm to the individual, his family and indirectly to the social order itself.

The remedy for such unjust distribution, in the absence of sufficiently compelling ethical motives, is being found in collective bargaining of labor. Here again is seen a need for balance. Collective bargaining finds its strength in numbers. So long as its demands are not unjust—are such as to allow difference in award sufficient to encourage greater educational investment upon the part of individuals—all will be well. Once let the power in numbers place all awards on the same basis and the race must deteriorate thru lack of individual initiative. There are certain well-recognized types of development. In every step in evolution, results have been brought about or have become possible thru variations suitably rewarded. Destroy suitable rewards and man ceases to make the effort necessary to exercise initiative; he becomes an associative thinker instead of a selective. We say of an individual often times: he is vegetating. The inference is clear: progress is possible only thru effort; continued effort comes only thru suitable reward.

7. **Summary.** Theory, science, the general, knowledge, technic, form are opposed to practice, the art, the specific, activity, skill, execution. The manual and industrial arts are the result of an attempt to provide a better balance between the abstract and the concrete, between theory and practice. An examination of the occupational data, such as may be found in the United States census reports, will make evident that many more people live thru the manipulation of concrete materials than thru the manipulation of ideas or abstractions. Education should look to the training of indi-

viduals along lines of materials manipulation as well as abstractions—the practical as well as the theoretical. Habits of mind and body, the attitudes, such as have to do with the manipulation of concrete materials, are to be acquired only thru experiences with data and methods of procedure common to such subjects. Theory cannot supplant practice; neither can practice, on the other hand, supplant theory.

Not infrequently, the man of so-called practical experience is inclined to ridicule the efforts of the man engaged in making a study of the science underlying such practical activities. Specific practical experiences are the necessary basis for the science, or theory, or art, but they do not of themselves constitute such science. Only as these specific experiences are generalized do they take the form of science. Much so-called new manual training and certain kinds of industrial arts, with their stressing of practical phases only, are likely to cause a distinct educational loss thru emphasis upon mere association to the exclusion of selection.

If the practically trained man has his weaknesses, the scientifically trained man, with no basis for his science or theory in practical experience, is also subject to serious handicap. Eight years of grammar school, four years of high school, four years of college, and possibly three years of graduate—all devoted to an attempt to master rules, principles, science, is a rather wasteful process. Science, technic, form cannot in any way serve as a substitute for trial and error in execution—for feeling. Theory or science is of value when applied. Too long continued attention to theory without application makes for lack of meaning in theory. Both theory and application alternating at not too infrequent periods are necessary to a vital educational experience.

Not a few manual and industrial arts teachers, taking their cue from certain so-called practical men of the trades, ridicule the use of texts in shop classes. If academic education

has over-emphasized a study of rules, principles, theory, manual and industrial arts will not better the situation by going to the opposite extreme in emphasizing feeling or direct interpretation to the exclusion of attention to the science underlying the subject-matter with which they are dealing. Texts are of two kinds, differentiated according as they do or do not deal with principles dissociated from application to some particular set of specific projects. The former is somewhat more difficult for student and teacher to use, but is superior in that the student must learn to think in terms of selective rather than associative connections. A properly written text is a good teacher's tool for effectively connecting theory and practice.

Race progress demands that a balance be maintained between conflicting aims, such as theory and practice. Social and economic considerations necessitate the statement that balance in conflict of aims making for race progress does not depend upon maintenance of balance of these factors in the individual. Some men may become thinkers, some doers in the world's work. In the long run special groups of a given type must be balanced by equally strong groups of opposite type. It is on this basis of social and economic rather than psychological need that training in low reactive types as well as higher types is justified. Such recognition of a place in education for low reactive types as well as higher should not be taken as signifying unjustness of present differentiations of awards on the basis of educational investment. Neither should the granting of the justness of differentiation in awards be taken as implying the justness of relative amounts of awards as at present distributed. Undoubtedly, members of the laboring class, in most communities, are not receiving a just share of awards for effort. The remedy for such unjust distribution, in the absence of sufficiently compelling ethical motives, is being found in the principle of collective bargaining. Here

again we need to maintain a balance. Appeals to power in numbers carried to the extreme of destruction of variations in awards will tend to eliminate originality and initiative.

Reference Reading:

James: *Talks to Teachers,* Chapter XIII, p. 150.
Judd: *Genetic Psychology,* pp. 58-68, 136-147.
Davidson: *A History of Education,* pp. 1-17.
Dewey: *How We Think,* Chapters X, XI.
Griffith: *Correlated Courses,* Chapter I.

Class Discussion:

1. Under what condition is progress most possible, emphasis upon theory or upon practice, upon the general or the specific, upon knowledge or upon action?
2. State the limitations which arise when either extreme is emphasized to the exclusion of the other for an undue length of time.
3. Recent progress in Germany industrially has been due to a wise balancing of science (knowledge) and industry (action). Give some specific examples.
4. How do we get our theory? What are some of the limitations of an education made up wholly of a manipulation of formulas, principles, and laws, a knowledge of which is got wholly from textbooks?
5. Of what value is shopwork to engineering students who do not expect to have to do any great amount of shopwork?
6. Would you say that a system of handwork can be justified wholly upon the ground of skill of hand—ability to perform readily certain highly specific operations? In general education or trade training?
7. Rule of thumb methods need what else to make them worth while for general educational purposes?
8. Can you see any place for texts in shop classes? State such advantages as you think may accrue from assigned readings upon related theory accompanied by recitations the following lessons.
9. State such limitations as you see in the use of texts in shop classes.
10. Judd says the teacher must "keep the memory processes open." What does he mean?
11. A man has worked fifteen years at his trade. Will he of necessity make a good teacher of his trade? Why or why not?
12. A man without other experience graduates from a correspondence course in machine work, will he make a good teacher of machine work? Why or why not?
13. State your conclusion as to theory vs. practice, knowing vs. doing.

APPENDIX I

Special Method Procedure

1. Special Method Aims. The work of the preceding chapters might well be classed under the heading of general method. An attempt was made to connect general principles of educational psychology with the special problems of teaching the manual and industrial arts. Before the student is thrust into actual teaching conditions, such as obtain in prac-

PROGRAM CARD
for
OBSERVATION OF MANUAL AND INDUSTRIAL ARTS TEACHING

(Fill out in triplicate) Student's name.....

Subject	School	Grade	Teacher	Day—Hour—Date M	T	W	T	F

(Reverse side of card.)

Instructions.—(1) Each student will elect a subject for observation teaching method according to his interests or his subject of specialization.
(2) He will examine the day-hour program of the manual arts work of Elementary or of University High School, or of other schools available for observational work, and make out a trial program.
(3) When this trial program has been approved by the instructor of Teaching Manual and Industrial Arts and the supervisor of practice teaching or the supervisor of other schools to be visited, a final program in triplicate is to be made out—one for the instructor, one for the supervisor, and one for student.

Fig. 28. Program Card.

tice teaching, it seems advisable to afford opportunity for the making of more specific connections. Special method lessons herewith seek to suggest a method of attack. Each lesson

involves two kinds of experience—one, individual planning of the teaching elements of given type lessons together with presentation and explanation of the same by some member of the class followed by class discussion of teaching methods used; two, observational work of expert teaching in manual arts followed by a carefully prepared report. The aim in this work is not so much one of study of organization of subject-matter and administration as of attention to the art or practice of teaching as tested by the principles discussed in the preceding chapters.

2. **Directions for Observation.** (1) Secure from the instructor of Teaching Manual and Industrial Arts four blank forms, Program Cards, Fig. 28.

(2) Using one of these cards as a trial card make out a trial program or schedule of proposed observational work to cover at least fourteen observational periods. Teaching schedules for Elementary and High School will be found posted in places designated by the instructor of Teaching Manual and Industrial Arts.

Make a selection of but one subject, as expressional handwork, technical handwork, mechanical drawing, etc., and confine observations to a detailed study of the teaching of some one person. Observation of the work of other instructors is advised, as arrangements can be made, but mainly for the purpose of assisting in a proper evaluation of the work of the teacher whose work has been elected for study.

(3) Submit the trial program for approval to the instructor in Teaching Manual and Industrial Arts and the supervisor of Practice Teaching.

(4) Upon approval, make out program in triplicate and provide one for instructor, one for supervisor, and one for self.

(5) Factors to be considered in making observations are

fully discussed in the chapters preceding. The student, while he may and should make note of any number or of all of these factors in any one lesson observed, will do well to pay special attention to some one factor at each lesson observed. For example, the first observation period may be set aside for especial attention to the teacher's outline of manual arts work, and the aim of the work as a whole. The second period may be devoted to those factors discussed in Chapter II, the next to those of Chapter III, etc., etc.

Each lesson should be carefully written up and these notes used in the writing of a final report. The final report should show that the student has learned to think of his special problem in terms of educational principles—in terms of analysis and reason as well as in terms of mere practical expediency. Care should be taken to avoid hasty generalizations. For example, a teacher may have planned to devote several periods to emphasis upon skill as opposed to initiative. Before such a teacher is condemned, it will be well to inquire of him as to his plans, in his general scheme of manual or industrial arts instruction, for the development of initiative.

3. **Type Lessons.** The aim in the type lessons experience is to accustom the pupil-teacher to the sensation of standing before a class and presenting a lesson which he and his fellows have carefully prepared in outline form beforehand, and for which he on his appointed day has also prepared his materials and tools. Where classes are not too large and students have not developed too great self-consciousness with loss of imagination, it is possible to reproduce classroom conditions, with the exception of those of discipline, to advantage. Where these conditions do not obtain, it is necessary to have the one demonstrating take time to explain the conditions which obtain in the problem being presented, and the means used to meet the situation. While this latter experience may

be less embarrassing to both demonstrating teacher and fellows, it falls short of emphasizing as vitally as it might the points to be brought out. It is one thing, for example, to explain how an illustrative lesson in the story of the Three Bears is to be given, and another thing to actually teach the class, even tho the class be one's fellows.

In elementary handwork the class may well add to demonstration the actual carrying out of instruction in work. In technical shopwork such type lessons will probably have to end with the demonstration.

Type Lesson I

I. Topic:
Special method—Type lesson. Expressional or illustrative handwork. Paper cutting and poster making. Stories, Grade I.

II. Required Reading:
Dobbs: *Primary Handwork,* Chapters I-IV.
Zeitz: Outlines. Appendix II herewith.
Dobbs: *Illustrative Handwork,* pp. 38-52.

III. Suggested Reading:
Other books on Elementary handwork. Cf. library finding lists.

IV. Assignment:
1. Making use of the form given in Chapter V, Dobbs: *Illustrative Handwork,* develop in detail an expressional lesson in paper cutting and poster making illustrative of some incident connected with the story of the Gingerbread Man.
2. Student demonstration or teaching assigned to....., who will make all preparations beforehand in the way of materials and tools in consultation with the instructor.
3. Begin observational work.

Type Lesson II

I. Topic:
Type lesson—Expressional or illustrative handwork.
Sand table chart. Grade II.
Stevenson: *Child's Garden of Verses,* The Swing.

II. Required Reading:
Zeitz: Outlines, Appendix II.
Dobbs: *Primary Handwork,* Chapter VII.
Stevenson: *Child's Garden of Verses,* The Swing.
Dobbs: *Illustrative Handwork,* pp. 57-74.

III. Assignment:

1. Making use of the form in Chapter V, Dobbs: *Illustrative Handwork,* develop in detail an illustrative lesson on the subject, The Swing, from Stevenson's *Child's Garden of Verses,* as you would have it worked out upon the sand table in Grade II.
2. Student demonstration or teaching assigned to....., who will make all necessary preparations beforehand in the way of materials and tools in consultation with the instructor.

Type Lesson III

I. Topic:

Type lesson—Technical handwork. Paper and cardboard construction, Grade I. Booklets (loose leaf), braid, cord.

II. Required Reading:

Zeitz: Outlines, Appendix II.
Buxton and Curran: *Paper and Cardboard Construction,* p. 138.

III. Suggested Reading:

Other books on elementary handwork. Cf. finding lists in the library.

IV. Assignment:

1. Making use of the form in Chapter XII, herewith, develop in detail a technical handwork lesson on Booklet Making for Grade I.
2. Student demonstration or teaching assigned to....., who will make all necessary preparation beforehand in the way of materials and tools in consultation with the in-instructor.
3. Continue observational work.

Type Lesson IV

I. Topic:

Type lesson—Technical handwork. Raffia, Grade II, Rugs for doll house.

II. Required Reading:

Zeitz: Outlines, Appendix II.
Dobbs: *Primary Handwork,* pp. 40-45.

III. Suggested Reading:

Other books on elementary handwork. Cf. finding lists in the library.

IV. Assignment:

1. Making use of the form in Chapter XII, develop in detail a technical handwork lesson on Rug Weaving for doll house for Grade II.

2. Student demonstration or teaching assigned to....., who will make all necessary preparations beforehand in the way of materials and tools in consultation with the instructor.
3. Continue the observational work.

TYPE LESSON V

I. Topic:
Type lesson—Technical manual arts. Mechanical drawing. Grade VII.

II. Required Reading:
Griffith: *Projects for Beginning Woodwork and Mechanical Drawing,* pp. 5, 6, 7 and plate 50.
Griffith: *Correlated Courses in Woodwork and Mechanical Drawing,* p. 91, Lesson 1, Grade VII.

III. Suggested Reading:
Other books on mechanical drawing. Cf. finding lists in the library.

IV. Assignment:
1. Making use of the form in Chapter XII herewith, develop in detail a technical drawing lesson for Grade VII.
2. Student demonstration or teaching assigned to....., who will make all necessary preparations beforehand in the way of materials and tools in consultation with the instructor.
3. Continue observational work.

TYPE LESSON VI

I. Topic:
Type lesson—Technical manual arts, Mechanical Drawing. Grade VII continued.

II. Required Reading:
Griffith: *Projects for Beginning Woodwork and Mechanical Drawing,* pp. 5, 6, 9 and plate 1.
Griffith: *Correlated Courses in Woodwork and Mechanical Drawing,* p. 91, Lesson 2, Grade VII.

III. Assignment:
1. Making use of the form in Chapter XII herewith, develop in detail a technical drawing lesson based upon the reading assigned above.
2. Student demonstration or teaching assigned to....., who will make all necessary preparations beforehand in the way of materials and tools in consultation with the instructor.
3. Continue observational work.

TYPE LESSON VII

I. Topic:

Type lesson—Technical manual arts. Woodwork. Grade VII.

II. Required Reading:

Griffith: *Projects for Beginning Woodwork and Mechanical Drawing,* pp. 5, 6, 9 and plate 1.

Griffith: *Correlated Courses in Woodwork and Mechanical Drawing,* p. 98. Lesson 13.

III. Suggested Reading:

Other books on mechanical drawing. Cf. finding lists in the library.

IV. Assignment:

1. Making use of the form in Chapter XII herewith, develop in detail a lesson in technical woodwork based upon the reading assigned above.
2. Student demonstration or teaching assigned to....., who will make all necessary preparations beforehand in the way of materials and tools in consultation with the instructor.
3. Continue observational work.

TYPE LESSON VIII

I. Topic:

Type lesson—Technical manual arts. Woodwork continued. Grade VII.

II. Required Reading:

Griffith: *Projects for Beginning Woodwork and Mechanical Drawing,* pp. 5, 8, 22 and plates 2-4.

Griffith: *Correlated Courses in Woodwork and Mechanical Drawing,* p. 98, Lesson 14.

III. Assignment:

1. Making use of the form in Chapter XII herewith, develop in detail a lesson in technical woodwork based upon the reading assigned above.
2. Student demonstration or teaching assigned to....., who will make all necessary preparations beforehand in the way of materials and tools in consultation with the instructor.
3. Continue observational work.

TYPE LESSON IX

I. Topic:

Type lesson—Technical manual arts. Metalwork. Grade X.

II. Required Reading:

Hooper and Shirley: *Handcraft in Wood and Metal,* pp. 66, 67, Steel scriber. Forging only.

III. Assignment:

1. Making use of the form in Chapter XII, develop in de-

tail a lesson in technical metalwork based upon the reading assigned above.
2. Student demonstration or teaching assigned to....., who will make all necessary preparations beforehand in the way of materials and tools in consultation with the instructor.
3. Continue observational work.

Type Lesson X

I. Topic:
Type lesson—Technical manual arts. Metalwork continued. Grade X.

II. Required Reading:
Hooper and Shirley: *Handcraft in Wood and Metal*, pp. 66, 67, Steel scriber continued. Cleaning up, hardening, tempering.

III. Assignment:
1. Making use of the form in Chapter XII, develop in detail a lesson in technical metalwork based upon the reading assigned above.
2. Student demonstration or teaching assigned to....., who will make all necessary preparations beforehand in the way of materials and tools in consultation with the instructor.
3. Continue observational work.

In a similar manner other lessons may be developed as desired. In industrial arts, if the work is organized for a rather distinct differentiation between instruction and production, as is the case of the work of the Lakeside Press School, Figs. 19 and 20, and the General Electric Co., Figs. 21 and 22, all those type lessons dealing with instructional problems may be made to take the form used in technical manual arts. The chief consideration here, as in technical manual arts, is to see that systematic and orderly introduction of instruction in new subject-matter and methods is made possible. In type lessons in industrial arts for production, instruction will be secondary; the emphasis being placed upon the development of efficiency in the work in hand, which work presumably is based upon instruction already given in the school shop.

APPENDIX II

Type Outlines

The type outlines which follow are intended to provide readily accessible reference material for grades I through VI out of which the student may build type lessons. In addition to these outlines the student will do well to make himself familiar with the material contained in standard texts having to do with subject-matter under consideration. A list of texts containing such reference material may be found by consulting library finding lists.

The outlines which follow are arranged in an order presupposing an organization of teaching materials in manual arts for general educational purposes as follows:

- Grades I-VI...
  - a. Expressional .....
    - Central and illustrative handwork.
  - b. Technical handwork
- Grades VII-IX
  - Technical shop and drafting work.
    - a. Mechanical drawing.
    - b. Woodwork.
    - c. Metalwork.
    - d. Electrical work, etc.
- Grades X-XI...
  - Carpentry or
  - Pattern making or
  - Machine work, etc., etc.
    - Organized for instruction.
    - Production secondary.
    - Pupil chooses one subject.
    - Emphasis on technic, form.
- Grade XII.....
  - Carpentry
  - Pattern making
  - Machine work, etc., etc.
    - Organized for production.
    - Instruction secondary.
    - Pupil follows choice made in Grade XI.
    - Emphasis on skill.
    - Part-time work if possible.

Justification of the above form of organization of teaching materials will be found in the author's *Organization and Administration of Manual Arts,* a companion text in preparation. Cf. Fig. 14.

TYPE OUTLINE—EXPRESSIONAL HANDWORK
PICTURE MAKING AND ILLUSTRATED BOOKLETS
OBJECTS AND SCENES IN CRAYON, PAINT AND FREE CUTTING

PREPARED BY JULIAETTA ZEITZ

For University of Missouri Bulletin, Vol. 17, No. 7.

	GRADE I.	GRADE II.	GRADE III.	GRADE IV.
Home	Washboard Tub Broom Teakettle Shoes Umbrella	House Furniture chairs tables Igloo Wigwam Tropical Hut	Foreign homes Foreign people Japanese temples Dutch windmills Indian bow and arrow	Homes and Costumes of India Palestine Philippines Modes of travel
Occupations	Spade Horseshoe Anvil Ax Hammer Street car	Hoe Rake Boats Ice-wagon Postman Mill-wheel	Plow Sack of flour Train Bucket of coal Lighthouse Fire engine	Farm products Manufactures Minerals Each group classified as to home foreign
Nature	Trees Leaves Snowflakes Animals rabbits cats bears elephants camels	Stars Moon Trees Fruit Vegetables Animals Birds	Aquarium tadpoles frogs crayfish fish Birds Animals of forest farmyard	Animals Trees Flowers Each group classified as to home foreign
Stories	Mother Goose Little Red Hen The Three Pigs Gingerbread Man Hiawatha The Pied Piper	Little Black Sambo The Cat Who Forgot How to Talk Jack and the Bean Stalk Sleeping Beauty Hiawatha Story of the Pilgrims Story of Columbus The First Thanks- giving	Child's Garden of Verses Town of Musicians Eyes and No-eyes Greek Myths Old Testament Stories History Stories Nature Stories	King Arthur and His Knights Hero Stories Birds and their Nestlings Phyllis Stories -Nature Aladdin Alibaba and the Forty Thieves Greek and Norse Myths

EXPRESSIONAL HAND-WORK—CONTINUED

POSTER MAKING AND ILLUSTRATED BOOKLETS

	Grade V.	Grade VI.
Geography	Outline maps of Missouri Colored to show corn regions coal regions fruit regions mineral regions live stock regions vegetable regions forests Animals of North America	Booklets Our World's Story Change of Seasons—causes Revolution and Rotation of the Earth Physical Features of North America Posters relating to travel in America travel in foreign lands customs, houses, people, and costumes of foreign lands chart showing the standard time areas evolution of travel occupations
Reading	Tanglewood Tales scenes characters Hawthorne's Life-Story Captains of Industry	Christmas Carol scenes characters Cricket on the Hearth scenes characters
Language	Posters Paul Revere's Ride Horatius at the Bridge Letters Bills	Illustrations for "Travel" by Stevenson Rewrite and illustrate stories Courtship of Miles Standish Letters Advertisements
History	Sketches to illustrate stories of the Romans stories of the Greeks stories of the Germans stories of the English discovery of America story of the Pilgrims colonial days modern days	The world in Columbus' time Life of Columbus The voyage to America America as he found it Colonial homes and customs Indians Settlements made by European nations

EXPRESSIONAL HAND-WORK—CONTINUED
POSTER MAKING AND ILLUSTRATED BOOKLETS

	Grade V.	Grade VI.
Nature	Posters how we are fed how we are clothed how we are sheltered Leaves Helpful birds Useful plants Harmful insects and worms	Posters and charts showing helpful birds and how to keep them harmful insects and how to get rid of them cotton from seed to cloth wheat, corn, flax, etc. our minerals and their uses trees and their leaves
Art	Designs for book covers wall paper rugs leather work costumes hats cross stitch embroidery calendars gift cards	Designs for booklets rooms wall paper houses rugs clothes Flower posters Plant posters Weed posters Perspective (one point)
Hygiene	What to do in case of fire How to carry a gun How to make a stretcher What to do in case of drowning How to stop bleeding Harmful work of flies	How a sand filter works Street cleaning methods How tuberculosis is spread A model dairy Places where germs breed
Arithmetic	Posters illustrating use of fractions measures money store problems	Figures illustrating fractions Figures illustrating decimals Measures The farm and its products Checks and bills

SPECIAL DAY PROJECTS

PICTURE-MAKING AND CONSTRUCTION—GRADES I to VI.

Columbus Day—Ships, animals, Indians, wigwams, bow, arrow.

Hallowe'en — Ghosts, pumpkins, apples, corn, jack-o'-lanterns, witches, bats, cats.

Thanksgiving—Trees, turkeys, log huts, animals, cradles, corn, wigwam, Indians, pilgrims.

Christmas—Trees, candles, stars, stocking, games, sleds, Santa Claus.

Lincoln's Day—Log cabin, ax, wooden shovel, pig.

Valentine's Day—Valentines, envelopes.

Washington's Birthday—Cherries, hatchets, colts, hats (three corners), coach, sword, raft.

Longfellow's Day—Home and life, illustrations for "Children's Hour", "Miles Standish", and other poems.

Arbor Day—Trees, spades, picks, sprinkler.

Circus Day—Animals, wagons, clowns, chariot, balloons.

May Day—Baskets, flowers, May-pole, queen.

St. Patrick's Day—Shamrocks, snakes, lizards.

Decoration Day—Flags, guns, caps, cannon.

Easter—Rabbits, chickens, eggs, baskets, flowers.

EXPRESSIONAL HANDWORK—CONTINUED
SANDTABLE AND CONSTRUCTION

	Grade I.	Grade II.	Grade III.
Sandtable	Indian life Columbus Day Thanksgiving Christmas Lincoln Day Washington Day Eskimo home Three little pigs An apple orchard Playgrounds Local activities Little Red Hen Billy Goat Gruff	Field and Pasture White Cloud Jose the Cuban Boy Garden of Verses The Lighthouse The Swing The Story of Ab Eyes and No-eyes St. Patrick's Day St. Valentine's Day	Dopp Series Cave Dwellers Tree Dwellers Robinson Crusoe The Line of Golden Light Mother Ocean's Children The lumber camp A cattle ranch Home life in other lands Japan China Holland

EXPRESSIONAL HANDWORK—CONTINUED
SANDTABLE AND CONSTRUCTION

		Grade I.	Grade II.	Grade III.
Construction	Home Life and House Problems	Play houses Own home Homes of story book friends Three Bears Little Jack Horner The Three Little Pigs	Homes of story book friends Own homes and homes of other children White Cloud Red Riding Hood Swiss Children The Dutch Twins	Own home as doll house Homes of other children Japanese Eskimo Bedouin
	Industrial Life	What is in grocery store dry goods store butcher shop blacksmith shop drug store	Sources of materials in stores Do they come from near home? Do they come from foreign lands?	Co-operative work postoffice fire department How we lived before the stores came Sources of food and clothing Sanitation of store and street
		Grade IV.	Grade V.	Grade VI.
Sandtable		Seven Little Sisters Alibaba and the Forty Thieves How Cedric Became a Knight King Arthur and His Knights The Children's Crusade Coal mine African jungle Fishing industries	Lewis and Clark Expedition Daniel Boone Colonial history tales Relief maps Paul Revere's Ride Panama Canal The Dog of Flanders Robinson Crusoe	Home life in foreign lands Holland Japan Animal life in other lands; in our own country Plant life of the continents Relief maps Transportation Industries Irrigation Sand filter Travel—Stevenson The King of the Golden River

EXPRESSIONAL HANDWORK—CONTINUED
SANDTABLE AND CONSTRUCTION

		Grade IV.	Grade V.	Grade VI.
Construction	Home Life and House Problems	Puritan home King Arthur's castle Seven Little Sisters Primitive utensils Primitive weapons	Colonial home Colonial utensils Home of Daniel Boone Home of Washington Home of Lincoln	Explorers Homes in Palestine Skyscrapers European homes European vehicles Dolls in foreign costumes
	Industrial Life	Local industries Transportation Weights and measures Advertisements Arrangement of stores Care of food	Larger industries shoe factory broom factory Sources of their material Useful trees (lumber) Ornamental trees Sanitation of store and factory Protection of workers against fire and accident Panama Canal and locks Mine and mine machinery	Evolution of industries transportation light heat measure time Animals that furnish clothing Animals that furnish food Plants that furnish clothing Plants that furnish food Manufacture of clothing

TYPE OUTLINE—TECHNICAL HANDWORK—GRADES I-VI. TECHNICAL PROJECTS

CHART PREPARED BY JULIAETTA ZEITZ

For University of Missouri Bulletin, Vol. 17, No. 7.

	GRADE I.	GRADE II.	GRADE III.	GRADE IV.	GRADE V.	GRADE VI.
Paper and Cardboard	Poster mounts Booklets *type—* separate leaves cord fastenings *use—* drawings cuttings of animals and stories Weaving, one inch measurements Easter baskets Christmas cards Lettering	Calendar pad (rough cover paper) Booklets *type—* separate leaves cord fastening *use—* stories pictures of birds, animals, etc. Bookmarks Weaving, one-half inch measurements Lettering	Booklets *type—* separate leaves Japanese sewing *use—* drawings stories nature notes Stiff paper box Bookmarks Portfolio (envelope) Lettering	Booklets *type—* paper back N.B. Japanese sewing *use—* maps stories heroes Penny padholder Clipping case Telephone pad Calendar pad Picture mount Filing case (with two envelopes) Lettering	Booklets *type—* stiff cover loose leaf *use—* drawings maps nature notes themes Portfolio Calendar pads (also cloth or wood) Waste basket Box (cardboard) Lettering	Bound books Box (hinged lid) paper Calendar pad (cloth, paper) Corners for blotting pad (cloth) Large portfolio Lettering
Wood	Doll house furniture Toys seesaw doll's swing Games	Games, ring toss Toys jumping jacks doll's teeter Playhouse furniture Blocks (building)	Games, bean bags Toys merry-go-round Furnishings for houses Furnishings for stores	Block print Balancing figures Toys jumping jacks tops kites Coping saw work, one-ply animals Doll furniture	Block print, wall paper, rugs, etc. Mechanical toys Sled Wagon Coping saw work, three-ply animals	Water wheels Electric apparatus Models of machines Athletic apparatus jumping standard hurdles Handkerchief box Stationery case Match case Wood baskets

	Grade I	Grade II.	Grade III.	Grade IV.	Grade V.	Grade VI
Cloth	Doll clothes Furnishings for doll house Bean bags Weaving rugs for doll house	Rag rugs for doll house Pillows Doll's one-piece dress Dustcloth	Cross stitch towel Iron holders Doll skirt, apron, hat Weaving, for play house	Rugs, woven plain stripes in border Darning stitch on towel pillow Cross-stitch curtains for play house Bags for paints and scissors	Weaving, vertical stripes, spot Simple garments apron handkerchief Table runners Bags Stitches French seams hemstitching	Weaving, diagonal or twill, plaid Stenciling table runners, curtains Simple embroidery Crocheting Tatting Hemstitching Simple garments
Clay	Fruit Animals Sandtable figures	Animals Objects Sandtable figures	Figures for sandtable and playhouse	Tiles Bowls	Tiles Bowls Inkwells Candlesticks	Inkwell, lids Candlesticks Vases
Raffia		Rugs for doll house Pillows for doll house Braid in three colors	Doll house furnishings Mats	Mats Trays Baskets	Trays Baskets Candle shades	Jardiniere Flower baskets Tea mats (sets)
Leather					Pen wiper Needle books	Blotter cover and corners Purse Cardcase Scissors case

No type outlines are given for technical manual or industrial arts subject matter above grade VI. Space available is limited, in the first place, and, in the second, the student needs only go to the library and he will find suitable material in the form of texts and bulletins for all the trades and industries usually taught.

OTHER BOOKS BY THE AUTHOR

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