

EDUCATIONAL PSYCHOLOGY

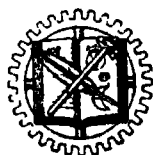


CARL EMIL SEASHORE

INTRODUCTION
TO
Educational Psychology

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NEW YORK
D. VAN NOSTRAND COMPANY, INC.
250 FOURTH AVENUE

1934

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To

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Dean of the Graduate School

AND

*Head of the Department of Psychology
State University of Iowa*

*World authority in the psy-
chology of tone, experimental-
ist, artful teacher and author,
whose practical contributions to
educational psychology have been legion*

To the Student who uses this Textbook:

This textbook represents many years of learning and experience on the part of the author. It does not treat of an ephemeral subject, but one which, since you are studying it in college, you must feel will have a use to you in your future life.

Unquestionably you will many times in later life wish to refer to specific details and facts about the subject which this book covers and which you may forget. How better could you find this information than in the textbook which you have studied from cover to cover?

Retain it for your reference library. You will use it many times in the future.

The Publishers.

FOREWORD

One of the chief problems of education is to teach people to practice what they preach. The world has long been full of theories that are beautiful, of maxims that are practical, and of knowledge that might be of use to all mankind. The trouble is that people too often fail to or refuse to act in accord with what they know. Physicians are said to lead unhygienic lives; many a lawyer dies without leaving a will. It is one thing to know a subject; it is something else to be able to apply it.

Education may be defined as *change*—the changing of the child from what he is to what we want him to become. What he is and how the change is made is largely a problem of psychology; and schoolmasters may be grateful to that body of scientists who, by research and investigation, have advanced this body of knowledge. Nevertheless it is one thing to know psychology and another to be able to apply it. Certainly professors of psychology, whose main interest is the development and working of the mind, are not reputed more skillful as teachers than their colleagues who specialize in the understanding of the earth, the elements, or the solar system. Theory and practice walk hand in hand only by compulsion.

Medical colleges, theological seminaries, and law schools have long faced this problem. There is always a background—a body of theory and knowledge that must be learned. There is also the practical field—a mass of technique and skills that must be acquired. How shall the two be connected? Sometimes theory precedes, as in the training of the preacher and the doctor; sometimes theory follows practice.

as in library training classes; sometimes the two are combined, as in the "case method" in the law schools.

In this book the author recognizes the problem and, as his solution, presents the general background of psychology (with an educational flavor), following this closely by educational applications directly related to the general principles discussed. Leaders should realize that this is an effort to bridge the difficult gap between what we know and what we do. It is to be hoped that we shall remember that knowledge is power only when it is applied, and that the test of our progress will lie not in the ability to reproduce letter perfect that which is written, nor to pass a final examination when completing a college course, but that our success will have its measure in the growth of our ability to understand, manage, teach, and guide the children who come to us to learn.

WILLIAM FLETCHER RUSSELL.

PREFACE

Beginning textbooks in educational psychology usually swing to one of two extremes: either they are given over to general psychology with a minimum of application, or they attempt to present the facts of application without discussing the theories upon which application is based.

Years of experience in offering beginning courses in both general and educational psychology have led the writer to conclude that:

1. While students carry away from a course in general psychology much that will be of value to them in later years, they do not retain facts and principles sufficiently well to guarantee any sort of adequate application in a succeeding course in educational psychology.

2. Nothing is to be gained by what proves in many instances to be an almost exact duplication of courses. That is, to offer a course in educational psychology which is but a re-hash of general psychology is a gratuitous disservice condemned by students themselves.

3. If an adequate application of the facts and theories of general psychology is to be made in the beginning course in educational psychology, those same facts and theories must be presented and discussed along with their application. Where there is probability of duplication one forestalls it by providing fresh points of view and varieties of interpretation.

In preparing this book the writer has kept in mind that, for the teacher and prospective teacher, the principles of psychology must find ready application; that is, they must be made to work in the classroom. Further he is convinced that

the teacher needs and must have specific direction for application, must have rules and recommendations for exact procedure. Throughout the volume therefore such rules and recommendations are provided.

The book is a departure from the usual run of textbooks in its field not only in that it makes extensive and specific application of psychological theory to classroom practice but in that it draws from all schools of psychological thought in the attempt to bring diverging views into harmony. It omits, naturally, all psychological theory that has no bearing on problems of general education.

The author is of course indebted to many psychological authorities. Where he has drawn from their works credit has been given at appropriate points.

A skeleton outline of the book is best presented through the problems of educational psychology. Those problems, as the author sees them, are as follows:

1. *We must provide methods for redirecting mechanical and conscious modes of behavior.*—A knowledge of inherited tendencies, habit reactions, and conscious states is psychologically valuable, but it is practically useless in general education unless we can apply what we have learned to educational situations.

2. *We must provide methods for redirecting conscious accompaniments.*—The inevitable accompaniments of conscious modes of behavior are: (a) the use of language as expression; and (b) the building of character. We must show how language may be made to serve the best ends and what steps should be taken in the effort to guarantee strength of good character.

3. *We must set up rules for teaching the child to think.*—In this task we are concerned with the development of not only logical and critical thinking but creative thinking as well.

4. *We must make provision for individual differences*—These differences are classed as physical, racial, maturity, sex, and mental. In its turn each type of difference must be covered by broad recommendations for educational recognition.

5. *We must provide methods for increasing the intelligence of behavior*—Here we are faced with the problem of presenting a satisfactory description of intelligence, through a discussion of mental growth and variations and of the measurement of general mental ability, to be followed by recommended teaching methods that intelligent behavior may be increased.

6. *We must provide methods for redirecting learning*.—Since the psychology we employ must serve educational needs, appropriate methods for redirecting learning, in the light of the demands of school subject-matter and in the light of the proper guidance of the school child, must appear at various points throughout any adequate discussion of educational psychology and must be brought to a focus at appropriate intervals.

All the way through we must keep in mind the major functions of the school: first, the acquisition of basic skills; and second, the inculcation of right habits, attitudes, ideas, and ideals.

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Introduction
To
Educational
Psychology

CHAPTER I

Conditioning of Inherited Tendencies

Man's chief inheritance is a plastic nervous system which serves as a starting point for all his behavior and as a basis for all his learning. Its activity produces a "stream of consciousness" and its sensitivity to stimuli results in inborn tendencies to respond—tendencies known as *reflexes* and *instincts*. These inborn tendencies, in turn, serve as starting points for many of our habits, sensations, and feelings, and it is with them that the study of educational psychology should begin.

This first chapter is to be given over, therefore, to a discussion of reflex actions and instinctive tendencies, with emphasis upon their modification but, before we can understand these mechanical or spontaneous modes of reaction, we must have a knowledge of the composition of the nervous system, the functions of the muscles and glands, and a clear conception of how learning grows out of stimulus and response.

Composition of the Nervous System.—The nervous system is made up of billions of nerve cells called neurones. (In the brain alone there are more than ten billions.) Each *neurone* has a *neucleus* which maintains the cell's vitality and from which run out fine *fibrils*, or threads, to the *axon* and *dendrites*. The axon may vary in length from a few inches to several feet, examples of longer ones being those which

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reach from the extremities of the body to the spinal cord
The dendrites are usually short, tree-like branches, some,

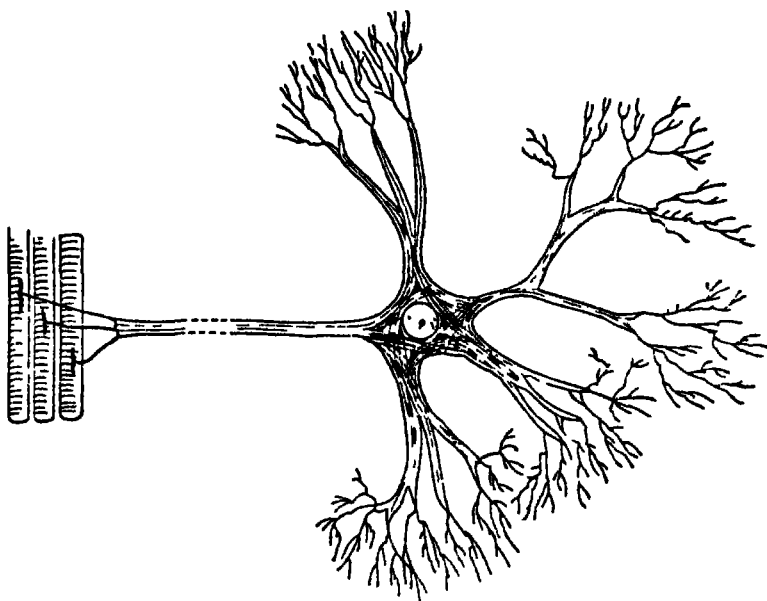


FIG 1

A neurone from the human spinal cord, highly magnified.

such as those found in the cord and brain, not exceeding one-twelfth of an inch in length

Nerves and Nerve Currents.—In the light of their respective functions, three kinds of neurones may be designated. Sensory neurones connect the sense organs with the spinal cord and mid-brain. Motor neurones connect the muscles and glands with the cord and brain. Association neurones, lying wholly within the cord and brain, connect sensory and motor neurones with other motor neurones.

The cell bodies of the neurones are located in groups called *nerve centers*, and the axons of the nerve cells compose the nerves themselves, known as *nerve fibers*. A small nerve may consist of but one fiber while a larger nerve is a bundle of fibers protected by a sheath. All are held in place by a soft cement called *neuroglia*.

When a sense organ is aroused to activity a *nerve current* is created which traverses a sensory nerve to a specific brain center where it transfers itself to a motor nerve, over which it passes to the muscles or glands. As this nerve current passes along, it makes contacts between the cells lying adjacent to each other, and this contact is called a *synapse*.

The synapse, it must be understood, is not a unit of structure but a contact between the branches of the neurones. The exact time that any synaptic connection is first made it is impossible to determine, for it may have been present from birth, may have occurred while the nervous system was maturing, or may have been formed in the course of learning. It offers, therefore, varying resistance to the passage of nerve currents, and its repeated use, it is believed, increases its conductivity.

Three Great Subdivisions.—The nervous system consists of three great subdivisions: (1) the central, or *cerebrospinal*, comprising the brain and spinal cord; (2) the *peripheral*, comprising the cranial and spinal nerves which connect the cerebrospinal system with various parts of the body; and (3) the *autonomic* which supplies such organs as the heart, the blood vessels, the intestines, and other visceral parts.

The cerebrospinal system, aided by the peripheral system, makes possible adjustment to the outside world. It dominates the nervous system in general, but the autonomic, as the name implies, operates to a large degree independently.

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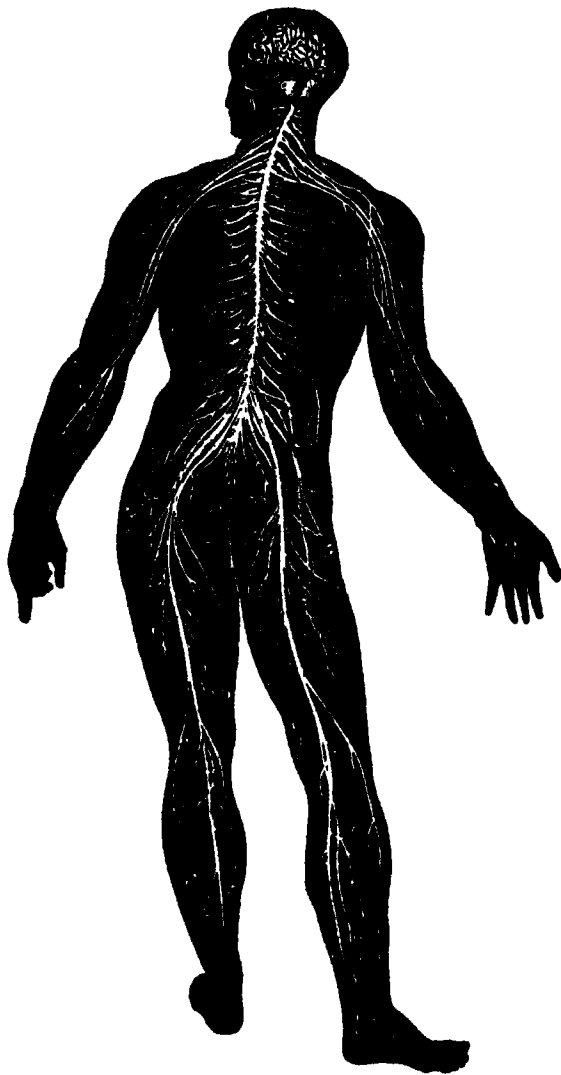


Illustration of the general arrangement of the nervous system, showing the brain, spinal cord, and nerves.

Gross Structure of the Brain.—The brain consists of gray matter, made up largely of nerve cells; and white matter, made up chiefly of nerve fibers. The largest part of the brain is the *cerebrum*, which consists of two hemispheres separated by a longitudinal fissure and having an external layer or cortex of gray matter. The hemispheres are connected by a band of nerve fibers called the *corpus callosum*.

Lying beneath the posterior part of the cerebral hemispheres is the *cerebellum*, a large mass of gray and white matter, the chief function of which is to maintain the equilibrium of the body. Besides that function it is thought to control steadiness and efficiency of muscular contractions.

Lying below the cerebrum and in front of the cerebellum is the *mid-brain*, composed of two large bundles of nerve fibers connecting the cerebrum with lower parts of the nervous system and of groups of nerve cells which have to do with eye movements and voluntary muscular activity.

On the lower surface of the brain lies the *pons*, a great mass of transverse fibers, part of the conduction path which unites the cerebrum and the cerebellum.

The *medulla oblongata*, which forms the upper part of the spinal cord, is made up of nerve cells and fiber tracts which control the reflex activities of the tongue, pharynx, larynx, and part of the thoracic and abdominal viscera.

Structure of the Spinal Cord.—The *spinal cord* is made up of gray and white matter, with the gray matter inside. The white matter consists of fiber tracts connecting the upper and lower parts of the cord with each other and with the brain, while the gray matter is composed of central and motor neurones. From each side of the cord, running to all the various parts of the periphery, are thirty-one spinal nerves—sixty-

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two in all. Each nerve contains both sensory and motor fibers, the former bringing in nerve currents from the sense organs, the latter taking them out to the muscles.

The Autonomic System.—The autonomic system consists of efferent, or outgoing, axons from centers in the spinal cord and medulla and has three divisions: one from the medulla, one from the middle of the cord, and one from the lower part of the cord. The upper division promotes the flow of gastric juice for digestion; the middle division checks digestion and hastens the heart beat; and the lower division is connected with the bladder, rectum, and sex organs. That the autonomic system may be controlled by the cerebral system is shown in the effect of thought upon appetites.

Specialized Areas of the Brain.—That the brain is the bodily organ most directly associated with consciousness has been recognized more or less clearly since the time of Plato, four hundred years before Christ, but it is only in modern times that advance has been made toward a definite analysis of the functions of the various parts. This was attempted early in the nineteenth century by the phrenologists (led by F. J. Gall) who held that mental faculties and traits of character are shown by the conformation of the skull; but the theory was erroneous in that it was based on the supposition that the brain exactly conforms to the shape of the skull. Nevertheless, Phrenology served a good purpose, that of stimulating scientific investigations of cerebral localization.

Only a few cortical centers have been positively determined, though many are approximately certain. It is probable that localization varies in individuals and, in cases of

injury, there is evidence of substitution, i.e., the taking over of the functions of the injured area by another area.

Work of localizing these specialized areas has been centered in studying the results of injuries, the removal of parts, electrical stimulation of the cortex, and in tracing bundles of nerve fibers. We can designate (see Fig. 3) certain areas of the brain as follows:

1. *The motor area*, lying alongside and in front of the central fissure. The upper parts of this area control the muscles of the lower limbs, and descending parts control the trunk, arms, neck, and head in ascending order. Injury to this area cuts off voluntary movement and cerebral control and may produce *apraxia* (loss of power to recognize an object or its uses) or *ataxia* (lack of power to coördinate voluntary muscular movements).

2. *The sensory area*, lying on the opposite side of the central fissure from the motor area. When this area is stimulated it refers the nerve current to the sense organ, such as is the case when one burns his hand. Further, when a sensory fiber above its peripheral ending is stimulated, such as when one strikes the ulnar nerve of the humerus (the "crazy bone"), the stimulation is referred to the peripheral ending. The question, "Why is it that a person with an amputated arm can still feel the fingers of that arm?" is often asked. The answer is: the stimulation previously referred to the fingers is still referred to them even though they are gone.

3. *The auditory area*, small region lying in the temporal lobe and connected with the ear. Injury to this area sometimes produces *auditory aphasia* (inability to hear words as they are spoken). Close to the auditory area is a small area which has to do with the recognition and understanding of

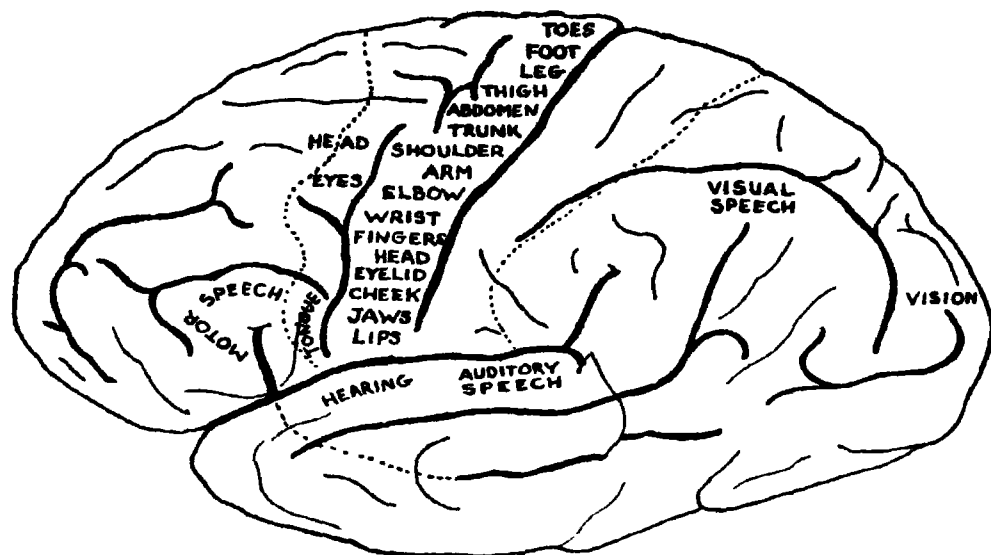


FIG. 3

Side view of the left hemisphere of the human brain, showing cortical localization of brain areas. Through studying the results of injuries, the removal of parts, electrical stimulation of the cortex, and in tracing bundles of nerve fibers, scientists have concluded that: the *motor area*, the center for muscular movement, lies alongside and in front of the central fissure of the brain; the *visual area*, the center for sight, lies at the back of the brain; the *speech area*, the center for elementary speech movements, lies in the frontal lobe of the left hemisphere; and the *auditory area*, the center for hearing, lies in the temporal lobe.

It now seems probable that localization varies in individuals and, in cases of injury, there is evidence of substitution, i.e., the taking over of the functions of the injured area by another area.

sounds. Injury to or disease of this portion may cause a person to lose the power to follow or appreciate music.

4. *The visual area*, relatively large region at the back of the brain, connected with the eyes. Injury to or disease of this region may produce one or more of a variety of conditions. If the eyes are in good condition and react to light but have no sensations of sight, the person is blind. He may be "blind," however, in specific ways. He may be color blind, object blind, word blind, or space blind.

5. *The speech area*, lying in the frontal lobe of the left hemisphere, connected with the mouth, tongue, and larynx. This area controls the coördination of elementary speech movements, and injuries here produce *motor aphasia* (inability to find the right words to speak).

There are also areas for smell and taste but these have not been definitely located. The writing area is a part of the motor area, while the sensory axons for touch terminate in the spinal cord.

The Muscles of the Body.—The muscles and glands constitute the reacting mechanism of the body. The *muscles* are divided into two classes: the striped muscles and the smooth muscles. The former (the striped muscles) vary in size from those of the eyes to those of the legs and arms, and consist of elongated cells (muscle fibers) which lie parallel to each other. The smooth muscles are found in the visceral organs—the stomach, the small and large intestines—in the genital and urinary organs, in the veins and arteries, and in the glands. They form the tissue such as is found on the walls of the stomach and are slow to react to stimuli but are easily affected by the discharge of certain chemicals from the glands.

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The Glands of the Body.—The glands of the body also fall into two classes: the duct glands and the ductless glands. The former are the salivary glands, the gastric glands, the liver, the pancreas, the kidneys, sweat glands, oil glands, tear glands, mucous glands, wax glands, and sex glands. Each, having a duct or tube, pours out its secretion onto the skin of the body or into some body cavity.

The latter, the ductless glands, known as the endocrine glands, have no outlet but produce chemical compounds absorbed by the blood. In line with their functions, there are nine different kinds of ductless glands, as follows:

1. The *thyroid*, located on each side of the windpipe and connected by an isthmus in front of it. It secretes a chemical called thyroxin which contains about sixty-five per cent of iodine.
2. The *parathyroids*, four in number and attached to the thyroid. They secrete a hormone (a chemical messenger) which is thought to prevent over-activity of the nervous system.
3. The *adrenals*, two in number, one lying at the top of each kidney. They secrete adrenalin which has to do with pigmentation, growth of hair, and transforms glycogen (a carbohydrate stored in the liver) into blood-sugar as a food supply for the muscles.
4. The *pituitary*, attached to the base of the brain by a hollow stalk. Its secretion controls the growth of the body and supplies food for the smooth muscles.
5. The *pineal*, located on the posterior surface of the brain under the cerebral hemisphere. It is thought to secrete a hormone which controls the development of the generative organs.

6. The *thymus*, located at the base of the neck. It is supposed to hold sex development in check and begins to atrophy at puberty.

7. The *mucosa of duodenum* (the mucous membrane of the shortest and widest part of the small intestine, about ten inches long). It secretes a hormone called secretin which stimulates the pancreas to greater activity and is thought to increase flow of bile from the liver at the same time.

8. The *pancreas*, an elongated gland across the abdomen behind the stomach. It has a duct which sends an alkaline secretion into the duodenum, but its ductless part secretes insulin which controls the sugar metabolism of the body.

9. The *puberty*, or sex glands. The ductless part of the puberty glands secretes a hormone which serves to activate the entire sexual life of both sexes.

Such of these glands as are important to educational psychology will be referred to again in a later chapter.

Stimulus and Response.—In order that the nervous system may function, man is provided with muscles and glands and sense organs. The sense organs, because they receive stimuli from outside, are called *receptors*; they appear in parts of the body where they are exposed to the action of physical forces.

A force that affects a sense organ is called a *stimulus*, i.e., it stimulates it to activity, as when light strikes the eye.

The receptors, through the peripheral system, are connected with the distant muscles and glands, and the latter are called *effectors* because they effect movements and secretions. They react to the messages sent from the sense organs.

As stated earlier, when a stimulus arouses a sense organ to its usual function it creates a nerve current which, unless

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deflected to a motor neurone somewhere below the cortex of the brain, travels along a sensory nerve to a specific brain center where it transfers itself to a motor nerve, over which it passes to the muscles and glands. The result is muscular contraction or glandular secretion. A conduction pathway, between the sense organs and the muscles and glands, is thereby established, and we call that pathway a *neural arc*.

The muscular contraction or glandular secretion is called a *response*.

Basis for Learning.—Knowing that the muscles and glands, either separately or acting together, supply the response to each stimulus, it may be seen how the nervous system, which is connected with all of them, is the basis for all learning. In considering this point it is well to get clear that nerve currents, set into action by stimuli, do not become scattered and diffused throughout the system but take short or circuitous routes to the effectors.

Again, it is well to remember that the nervous system is so articulated, even though the cell bodies group themselves into nerve centers, that each part is not only connected with every other part but is connected as well with all parts of the body. Thus, when a stimulus, acting on a sense organ, is transformed into a nerve current and is carried to its proper effectors, the whole nervous system is directly or indirectly affected.

Basis for Consciousness.—The question naturally arises: If the nervous system is the basis for all learning, must it not also be the basis for consciousness? Consciousness and behavior, as we have implied, are interdependent, and, up to this point, we have been speaking of behavior as if it could

result only from a purely mechanical process. Such a theory of behavior is proposed by the "behaviorists" themselves who do not admit the existence of consciousness and hold that stimuli are always provided by the environment or by movements of the muscles or by secretion of glands.

For the reason that it cannot be seen and therefore described, nothing much is known about consciousness, but we may follow the assumption that it does exist and that it is centered in the cortex of the brain, that outer layer of gray matter of the cerebrum and cerebellum. At least we know that some kinds of injuries to the cortex will produce *unconsciousness* (the temporary cessation of mental activity), if not indeed death. This mental activity, it is assumed, is created by nerve currents originating in sense organs and passing through the spinal cord and mid-brain to the cortex. Also we know, as pointed out above, that injury to, disease of, or removal of various parts of the cortex will result in the loss of sensations, which means, of course, that the effectors have been cut away from the neural arc and that the nervous system is not functioning in building up and maintaining that which is called consciousness.

Unlearned Responses.—Inborn tendencies, or unlearned responses, are often referred to under the one term *instinctive tendencies*, but they may be more easily understood if classified into two or three divisions. We may therefore describe inherited dispositions by treating them as reflex actions and instincts, dividing the latter into two groups on the basis of their relation to habit. It should be understood in advance, however, that the classification is hypothetical. We do not know where reflex action leaves off and instinctive tendency begins nor to what extent instinctive tendency is overlaid by

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habits. The classification we employ is solely for purposes of clarity.

REFLEX ACTIONS

A reflex is best described as a simple, frequent and rapid-motor response to a sensory stimulus. It comes in the form of a pattern and is perfect at birth.

"Pure" Reflex Action.—Whether or not any single reflex is pure we cannot be sure, but there are some called "pure" because they are least subject to modification by other actions of the nervous system. Examples of the so-called "pure" reflexes are: winking, snoring, shivering, and trembling.

Two Classes of Reflex Action.—Of the large number of our reflex actions the majority may be classified in one or the other of two general divisions:

(1) The *protective reflexes*, such as those of the eye. When something touches the eyeball, or even approaches it, the lid closes in a flash—in five-hundredths of a second, in fact. When a bright light strikes the eye, there is a pupillary reflex—a narrowing of the pupil to accommodate it to the light. Other protective reflexes are sneezing, coughing, and withdrawing the hand when in contact with fire.

(2) The *regulative reflexes*, such as the muscular responses of the stomach, swallowing, hiccoughing, discharge of the salivary glands, and the secretion of tears when a foreign substance gets into the eye.

Modified Reflex Action.—In infants some reflexes are present which are definitely subject to modification in the adult. Among these are: sucking, biting, spitting, turning, grasping, and kicking. As the infant develops and finally matures, modification comes through inhibition or reinforce-

ment Take the reflex action of sneezing as an example. One may, through "self-control," inhibit a sneeze; or he may prevent it by pressure on the upper lip; or he may clear out the nose; or he may modify it by letting it go with full force and a loud noise. Coughing and hiccoughing come in this category, as do yawning, groaning, laughing, crying, scowling, gasping, and stretching; and sometimes added to these are the posture reflexes: holding the head erect, sitting, standing, and keeping one's balance.

Simple and Compound Reflexes.—Response through reflex action may involve but one neural arc (the conduction pathway between the sense organs and the muscles and glands) but, usually, it results from a number of arcs acting simultaneously.

A *simple reflex* is made up of a few arcs (or, it may be, just one) and is usually a lower reflex, depending upon where it takes place in the nervous system. An example of a simple and lower arc is the patellar reflex, or knee-jerk, resulting when the knee is struck just below the knee-cap. This is in reality a lower spinal reflex, and has been timed at three-hundredths of a second.

An example of a *compound reflex*, which is at the same time a higher reflex, is the thirst reflex.

Secondary Reactions.—Not to be confused with native reflex reactions are the automatic and almost unconscious reactions we acquire. For example, when the classroom door is suddenly opened and the wind lifts a sheet of paper from your desk, you quickly rescue the paper by grasping it or slapping the hand down on it with force. You do this without thinking; the action is automatic and unconscious, but it is not inborn; you have learned to react in this manner. Again,

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a pencil above the ear starts to slip. You grasp it quickly and restore it to its place. The action is reflexive in its nature, but it has been acquired and is never so quick as the true reflex.

The Conditioned Reflex.—A *conditioned reflex* is a simple motor response in which the stimulus has been arbitrarily selected—the same response being produced by an associated and substitute stimulus. Let us illustrate by drawing from the researches of the Russian scientist, Pavlov.

Pavlov's Experiments.—Pavlov, interested in the conditioning of reflex action, worked almost entirely with dogs. When a dog is given a piece of meat a natural response is an increased flow of saliva, resulting from connections between the organs of smell and taste and the salivary glands. To produce the same response by an associated stimulus, Pavlov rang a bell each time the dog was fed until, the association finally made, there was a flow of saliva at the sound of the bell—a learned reaction.

The experiment was varied in other ways. Substituted for the bell was a gentle scratching of the dog near the ribs, and the application of ice to the body while the dog was eating. Eventually the flow of saliva would be produced by these associated stimuli.

Work of Krasnogorski.—Krasnogorski, one of Pavlov's students, was the first to apply the latter's experiments to young children. He used the conditioned salivary reflex by employing a variety of stimuli: the sight of food, a bell, the sound of a reed pipe, and a slight scratch on the skin, measuring the amount of secretion by counting the number of mouth-openings and swallowing movements. He concluded that:

1. Conditioned reflexes can be built up as early as the first year of life.
2. Almost any stimulus can serve as a substitute stimulus.

Lashley's Experiment.—Lashley devised a cup which could be attached to the inside of the human cheek to catch drops of saliva. He first determined the normal amount of saliva flow in the subject, then measured the amount of secretion when a bar of chocolate was presented at arm's length, was permitted to be smelled by the subject, or held close to the lips. The results were as follows:

Normal rate about one drop per minute.
Chocolate placed in subject's hand—

1st minute	.. 4 drops
2nd minute .	.. 3 drops
3rd minute .	.. 4 drops
Subject smelled chocolate .	 5 drops
Brought chocolate to lips but mouth closed .	 9 drops

Work of Mateer.—Mateer extended and verified the work of Krasnogorski. She selected about fifty normal children between the ages of one year and seven years, and a few feeble-minded children. Working with the salivary reflex, she noted the number of swallowings, and her conclusions are stated briefly as follows:

1. Conditioned reflexes in normal children are learned and unlearned (die out when not reinforced by natural stimulus) in about one-half the number of trials necessary to the feeble-minded.
2. A substantial relationship exists between the ease of conditioned-reflex formation and mental ability.
3. The method gives a direct measure of native learning ability.

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Hudgins' Experiment.—Hudgins has been able to train the pupil of the human eye to react first to the sound of a bell; then to a movement of the hand; later, to the commands “contract” and “relax,” so that finally the subject has what is called “voluntary” control over the activity of the pupil. Hunter, commenting on this experiment, states that it is probable that when man or animal does such an act voluntarily, he is in reality responding in terms of conditioned reflexes. Hunter states also that three important laws of learning have come out of conditioned-reflex experiments with animals:

1. Less fundamental forms of behavior become attached to or conditioned to more fundamental responses.
2. The new object to which we wish the animal to respond must be presented simultaneously with or before the old object to which he now responds.
3. If conditioning is to result, the old and the new objects must be presented together frequently.

Hunter adds that some animals can learn by the use of ideas and that a sharp distinction between learning by ideas and learning by conditioned reflexes is not justified.

Delayed and Memory Reflexes.—The various experiments with animals have shown that there are delayed and memory reflexes. After practice in observing an interval of elapsing time between an arbitrary stimulus and a natural stimulus, such as between the ringing of a dinner bell and the smell of food, salivary secretion will not start until the usual time is up even though the bell is rung continuously. A conditioned reflex which starts at the end of the usual time is called a *delayed* conditioned reflex.

Again, when the delay becomes habitually longer, i.e., food is regularly not available until some time after the ringing of

the bell, there may be a *memory* reflex, the memory of the sound of the bell being sufficient to produce salivary secretion

Arbitrary Modification of Reflexes.—In working out methods for conditioning reflexes, psychologists have given us objective means for explaining complex behavior. It now seems certain that some habits are nothing more or less than groups of conditioned reflexes, and, though all habits may not be so accounted for, much light has been shed on the laws of habit formation or, in other words, the laws of learning. We know that, soon after birth, unconditioned reactions of children become conditioned in a great variety of ways, so that we may say that the child's education is a process of acquiring: (1) conditioned reflexes; and (2) habits. When we take up the subject of habit formation this process will be discussed at length.

(The conditioning of the so-called "pure" reflexes, such as winking, shivering, and trembling, is not a task for the classroom teacher but for the experimentalist. The teacher, it is true, may modify them temporarily by removing their cause, but, in so doing, she does nothing to the reflex itself; it will arise again when the cause appears.

Other reflexes, though, the teacher is in a position to modify. She can make less potent such reflexes as sneezing, coughing, crying, scowling, and stretching by causing the child to inhibit them each time they arise. Whether or not she should do this depends upon the needs of the child and the group. Sneezing and coughing, for example, are protective reflexes. They help the child free himself from annoying physical states. So far as classroom control is concerned they are to be modified only when there is likelihood of infecting others of the group. The same may be said of crying. Sometimes, as we shall show in our discussion of

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emotions, crying is an avenue for "blowing off steam," and it is to be inhibited only when it takes on the earmarks of a habit or interferes with group decorum. Scowling is to be discouraged, of course, and stretching is to be modified by permitting it at appropriate periods.

It is obvious that the teacher conditions reflexes when she helps the child build right motor habits. She teaches him, for instance, if he has not already learned to do so, to cover his mouth with his hand when he yawns, and, by insistence, she is able to make this act so habitual that not only does the hand automatically respond to the yawn but the yawn itself, in time, is "smothered" or checked by the substitution of other motor acts.)

We need not here set up definite rules for the modification of reflex action. Such modification as is necessary in the classroom will be apparent in our discussion of group instruction in hygiene. We may reserve, therefore, further application for chapters that treat habits, sensations and emotions.

INSTINCTIVE BEHAVIOR

If, for purposes of clarity, we are to classify reflexes and instincts separately, let us draw a hypothetical line between them. The reflex action, we said, is a simple, frequent, and rapid motor response to a sensory stimulus, and is perfect at birth. An instinct is also a motor response to a sensory stimulus, and it is inborn, but it is not so prompt in reaction as a reflex. An instinct is best defined as an aroused tendency toward reaction which persists for a time and paves the way for other reactions.

Classification of Instincts.—With respect to function, instincts are usually classified into three divisions:

(1) Responses to organic needs, such as those connected with hunger, with breathing and air-getting, with heat and cold, with shrinking from injury, with crying, and with fatigue, rest and sleep.

(2) Responses to other persons, such as herding or gregariousness, and mating.

(3) The play responses, in which are included locomotion, vocalization, manipulation, curiosity, caution, contentment, laughter, fighting, self-assertion, and submission.

Tendencies Selected for Discussion.—Because we must keep within the limits of classroom application, we may drop out, for our purposes, certain of the responses to organic needs, and may distinguish between (1) instinctive tendencies common to all normal children and (2) instinctive tendencies common to but a small minority. The latter we shall call “habit-forming abilities.” Let us discuss first six instinctive tendencies common to all normal children:

Expression.—Since the first cry of the new-born babe comes earlier than most of the reflex actions mentioned, it might well be classified as a reflex. In a strict sense it is; it is simple, frequent, and rapid, and is perfect at birth. However, it is the first manifestation of the tendency toward expression and is, more closely speaking, an instinct.

As the healthy infant grows and develops, vocalization develops concomitantly, and the cooing and babbling sounds, at first purely instinctive, are the forerunners of speech and song. We speak of the latter as modes of expression, and, for the reasons given, may include expression as one of the instinctive tendencies common to all normal children.

Facial expression and gesture are the instinctive outcroppings of an inborn tendency to aid vocalization in making the

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wants known. They, like speech and song, are subject to modification and should be included under the general heading of expression.

We should make this distinction then: the power of expression is native, while the vehicles of expression, such as language, music, and art, are acquired. Of language we shall have much more to say at a later time.

That the power of expression is inborn is demonstrated by the fact that every stimulus results in action in some form. Every impression must have its correlative expression. When the child is "impressed," i.e., stimulated, his common response is a muscular movement—the whole body, or the arms, legs, shoulders, facial muscles—or the glands may be affected. Consequently we have such outward forms of expression as the frown, the smile, the gesture, speech, tone of voice, laughter, tears, and tensivity of attention.

However, these outward signs of expression do not always appear. A stimulus may result in a feeling or thought not openly expressed, and such feeling or thought constitutes a reaction, later, perhaps, to find expression in some muscular response.

For education these facts are highly significant. With the child ready to respond to each impression, stimuli should be carefully selected and impressions clinched by permitting appropriate and natural forms of expression. In other words, *the native tendency of expression should be directed toward the building of right habits of motor response, such, for example, as speech, writing, music, and art.* Give the child an opportunity to make outward response to desirable stimuli and the lesson to be learned will sink in.

Manipulation.—The instinct of manipulation appears very shortly after birth. At first it comes in the form of random

activities, such as putting the hand in the mouth, waving the arms, and kicking the feet. Later, as objects attract the child's notice, it takes the form of the manipulation of these. The child picks up a rattle, not so much at first to hear the sound it makes, but to satisfy the need for muscular activity; for the rattle is usually thrown from the crib, as is also the ball, spoon, teething ring, or whatever is at hand.

That this tendency continues through later years is witnessed on all sides. It is true that objects once stimulating lose their attraction but others come to succeed them, so that nearly everybody has a penchant for grasping, pinching, picking up, or toying with objects in which there may be no direct interest. Handling objects on store showcases and scribbling on wall-paper while using the telephone are instances of this tendency.

The usefulness of manipulation lies in the preparation it affords for acquisition of basic skills. If there were any way to measure the relationship, a high correlation between the tendency to manipulate and skill in mechanical activities probably would be found.

In any event, we have recognized for long that the child should be required to *do* something in connection with all of his school subjects, and we see that his natural tendency to manipulate objects will help there. He is natively interested in action and his emotions are easily stirred by pictures, models, and other material constructions. These should be used for vividness and emphasis in reinforcing original experience, but they should be appropriate for age and grade.

Each concrete experience should be selected, therefore, on its appropriateness, but it also should have the power to impart meanings and should aid in the mastery of facts. The drawing of pictures, working in sand or clay, and cutting

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figures and designs from paper are examples of such experience that go far in stimulating further learning.

Curiosity.—The instinct of curiosity is the first of three adaptive tendencies, so called because they make it much easier for the child to fit into the world about him.

For the first few weeks of the child's life he is attracted to almost any object that comes within his range of vision, particularly if it be moving. He will make an effort to reach it, handle it, put it in his mouth.

At first there is no caution, but later, through the punishments of environment, he learns to approach more slowly, to appraise the object with his eye, to use the hand less, and the mouth scarcely at all.

With the coming of language a personal examination of the object is not necessary, yet the instinct still has force. The child begins to question: "What is that?" and "What is it for?" If the answers are satisfying, learning is under way, and in that sense curiosity may be described as "intellectual hunger."

Not all such hunger results in learning, however. The instinct may be loosely organized, and we find, even among grown-ups, an "insatiable curiosity" that remains insatiable because it does not wait for responses to questioning. It prompts the individual to continuously "keep his nose in somebody else's business."

In education, acquisition of the fundamental subject-matters is, in no small measure, dependent upon the arousal of the child's curiosity; but, being a native tendency to acquire knowledge for its own sake and because it does not look to future ends, curiosity may be idle and fleeting and result in little effort and progress.

What is needed, therefore, is not suppression of the child's

natural curiosity but efforts to make it intelligent. Teachers sometimes discard methods because they appeal directly to curiosity, but if the appeal leads to some intelligent end and does not remain on the level of mere idle wonder, it is justifiable.

The easiest appeal to curiosity is through the desire to hear a story, or to see something new. Every normal child will respond to these devices, and they should be used in the attainment of some definite end. *Begin by determining upon a definite end to be attained and either select something new to the child's experience or relate, in his own terminology, a story which will set him to think about that end.*

It must be kept in mind that the main purpose here is not to amuse the child nor to give him pleasure but rather to encourage him to put forth greater effort in pursuit of knowledge.

Imitation.—The tendency to imitate may be called an unlearned tendency to learn. It is one of nature's strong provisions for adaptation and, although it may be consciously controlled toward profitable ends, in the young child it is almost as unlearned in its bearings as the urge for food or sleep. This is because the act of imitation results simply from observation of the act imitated and is in no sense purposeful.

However, there are several kinds of imitation, brief definitions of which will bring out their differences:

(1) *Reflex imitation* is a physiological tendency to repeat the act performed by another, such as yawning, crying, or laughing in imitation of someone else.

(2) *Spontaneous imitation* is a tendency to imitate, without purpose, anything seen or heard. A mother goes to the door to call her young son. "June-ye!" she cries shrilly,

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with accent on the second syllable, and the neighbor's boy repeats the cry with the same intonation.

(3) *Dramatic imitation* is a tendency to imitate, also without purpose, things seen, heard, or read at previous times. It differs from spontaneous imitation in that the child employs his own manner of interpretation.

(4) *Voluntary imitation* is imitation with a purpose, i.e., imitation with a goal in view, such as impersonating the walk of another in order to produce a laugh, or, in a more serious endeavor, reproducing another's drawing by seeing it done.

(5) *Idealistic imitation* is imitation in which a standard is followed. It is often said that the success of an artist is gauged by the number of his imitators. He sets a standard which many try to follow in general application.

In classroom situations, when we try to identify the child's different imitative responses, we get the following varieties:

(1) The response to a smile or a frown, to ill temper or even temper, to acrid or pleasant tone of voice—reflex imitation.

(2) The response to gestures, movements, and sounds as they are seen or heard—spontaneous imitation.

(3) The response in which the child is represented by substitution. He is a bear, policeman, cow-boy, or whatever he has observed or heard about but which is unattainable to him—dramatic imitation.

(4) The response in which the child learns to do the thing by seeing how it is done, such as learning to add or to use good grammar—voluntary imitation.

(5) The response to ideals or standards of conduct, such imitation as is found in hero-worship—idealistic imitation.

The child is most likely to imitate first the personal and the novel. Personal demonstration and example, therefore, in language, habits, and skills, provide the easiest way for

appealing to this tendency. Following these, imitation may be redirected through the study of characters worthy of emulation. Consequently the teacher should do two things: *(1) form the habit of weighing everything said or done in the light of its ultimate effect upon the child; and (2) seize every opportunity to impress upon the child acts and traits worthy of imitation.*

Play.—A third adaptive tendency is the disposition to play. Here is activity for the sake of activity, and the child delights in it. He learns through play to control his muscles, to make new movements, and to coördinate movements. He begins to play long before he is able to sit alone, and, when necessity arises, is content to play alone. Through play he grows and develops and eventually learns to work. In many ways it is nature's most gracious gift to the human being.

Play is, however, tied up with other instinctive tendencies, and, except for its universality among infants and its initial strength as an instinctive tendency, might well be listed as a habit-forming ability.

In the activities of the school child, play is made up of imitative acts and of contest and competition. It has strong physical values, but it also has mental and social values. It brings quick perception and develops imagination, reason, and self-control. Further, it develops a spirit of coöperation, teaches the child to meet competition, to face opposition, to accept defeat, to control his temper, and to respect his opponents.

Play, then, as a native tendency, should be coördinated with all other school work. When directed with definite ends in view, it finds its best outlet in dramatization, in make-believe. If, as Dewey says, the child is allowed to act out

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an idea, one of two things is sure to follow: the idea becomes real to him, or a lack of understanding is shown in what he does.

Play should be used for its mental and social values as well as its physical values, and, where opportunity offers, the ideas the teacher wishes instilled should be caused to become real to the child by permitting him to act them out.

Fighting.—Finally we may list fighting as an instinctive tendency, the stimulus for which is ordinarily interference or restraint of some kind. In the infant it is first manifested by crying, turning the head, pushing with hands or feet, or by all of these simultaneously. Later, in the child, fighting takes the form of stamping the feet, striking the head on the floor, or even attacking the person or object interfering.

As the child grows to adulthood, learning changes the form of the fighting instinct. The boy may go in for scientific boxing, the girl for scientific tongue-lashing. Generally, however, where the tendency continues, angry talk is the net result, or, as in business or politics, reputations may be damaged and careers made or cut short.

In school situations fighting takes two common forms: resistance to the teacher's instructions, and actual physical combat between pupils, usually boys.

The second, physical combat, has been the subject for much debate in education. On the one side are those who disapprove of fighting in any form and on the other those who would stimulate the fighting instinct but who would at the same time substitute for crude and natural physical combat more refined means for overcoming obstructions; they believe it to be wrong to crush out the fighting instinct and go so far as to recommend the settlement of disputes by the use

of boxing gloves. A child, some believe, should never be told that he must never fight, else he will be imposed upon. Methods of combat should be advanced, but the values which justify fighting should be stressed.

The recommendations here may be stated as follows: *Never meet resistance to instructions with anger but rather with calm resistance in return, with indifference, or with isolation. Use the manifestation of the fighting instinct as a cue in the effort to build up self-control. Do not try to crush out the fighting instinct, but let fighting be justified only for such values as self-respect, family honor, and the rights of the weak.*

HABIT-FORMING ABILITIES

Instincts are not ancestral habits handed down to us through many generations. The "pure" instinct, i.e., one least influenced by other actions of the nervous system, is inborn, but habits must be acquired. There are, though, many instincts overlaid with habits, i.e., they are consolidations of instinct and habit, and habits, as we shall see later, are believed by some psychologists to be complex systems of reflexes. In this connection we have already mentioned Hunter's theory that ideas and conditioned reflexes may be one and the same. There is reason, therefore, for picking out certain instincts clearly overlaid with habits. For convenience we may call these *habit-forming abilities*, remembering, however, that they belong in any acceptable list of instincts.

That the term may be clearly understood, let us say that a habit-forming ability is a pronounced instinctive tendency to develop habits in specific directions. Further, it is usually described as individualistic, or not common to everybody.

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A discussion of a few of these instinctive abilities will serve to make the distinction still clearer:

Self-Assertion.—Self-assertion is an example of an instinct overlaid with habits. As is true of the instinct to play, it manifests itself in a number of ways, and, in a sense, is the child's strongest tendency, since nearly every act can finally be traced to some fundamentally selfish motive or urge. It is classified here as a habit-forming instinct because it is a native ability to acquire basically selfish habits.

Self-assertion appears in four varieties of behavior: (1) overcoming obstruction; (2) resisting domination by other persons; (3) seeking for power over things; and (4) seeking for domination over other people. That it is not common to all children is shown in the fact that in some a tendency toward submission is as strong as self-assertion is in others.

The fighting instinct largely dominates the instinct of self-assertion. This is shown in the child's tendency to resist when things do not "go just right." He wishes to control the activity. A toy or a whistle he is making, or a dog he is trying to train may get out of control and suddenly become the object of violent attack; even a problem in computation for which he cannot find the correct answer may cause him to tear up his paper or throw his chalk to the floor. Nor does the tendency stop there. Where it is strong, the child not only resists against domination but seeks to dominate others. Sometimes this takes the form of teasing or brow-beating, particularly of weaker and younger children or of the mentally unfortunate, but is more frequently witnessed in the gratuitous attempts of one to manage the affairs of others.

Self-assertion, though, is not to be too greatly inhibited. It helps to provide leadership. We may recommend this,

therefore: *direct self-assertion into habits of self-reliance and self-confidence.* As for the counter tendency of submission, yielding, or abasing one's self, the teacher should *attempt to substitute self-confidence for self-abasement by encouraging positive and constructive reactions.* In meeting the issues presented by self-assertion or submission one should keep in mind the greatest good for the greatest number.

Acquisitiveness.—An occasional child, usually in the pre-school years, exhibits a strong tendency to acquire possession, to claim as his own everything that interests him. Especially is this true of the child "spoiled" by the attention of older persons and who has not been taught to share his possessions with others. In trying to keep him busy and happy, adults often go to extremes in supplying him with things which give him pleasure, and frequently the only value he puts upon these is that they are *his*.

This inborn tendency to acquire for the sake of acquiring often survives the first few years and we find it occasionally among children of school age, among whom sometimes it becomes the foundation for moral issues, in that it leads to habits of stealing. In such instances it is very difficult to know where to draw the line. We excuse the very young child for taking things which belong to others, but the child of school age is "supposed to know better," is supposed to have substituted habits of honesty for habits of acquisitiveness. Where this tendency has carried over as a thoughtless activity, the best way to offset acquisitiveness is through lessons of give and take, i.e., *cause the child to part with something for each thing he appropriates, and to share equitably everything he has.*

The usefulness of acquisitiveness lies in the fact that chil-

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dren may be taught to acquire right habits and skills in substitution for the tendency to think in terms of property values alone.

Collecting and Hoarding.—The tendency to acquire naturally results in the tendency to collect (to assemble a great variety of objects) and hoard (to store away without discrimination as to real values). That this is a habit-forming ability and that it has no survival value except under direction is shown in the fact that most children must be taught to save. It is more pronounced in boys than in girls and is tied up with manipulation, imitation, curiosity, play, and other instincts. Where it is tied up with other tendencies, such as curiosity or imitation, it may continue in its original form for months or years and may even result in miserliness.

For education the tendency to collect and hoard offers opportunity for training along several lines and we may make the following four recommendations: *use this tendency to cultivate system and orderliness; use it as a foundation for right habits of thrift; let it serve as a starting point for scientific collections, such as leaves, flowers, plants, insects, shells, stones, and fossils; and employ it in training the child to take intelligent short cuts, that time and energy thus saved may be devoted to other worthwhile activities.*

Rivalry.—By the term "rivalry" as used here is meant competition between individuals for approbation or for a prize. In some school children this ability is much pronounced, but it is a tendency which does not appear until school age or shortly before. When it does appear it comes with a rush and, through voluntary imitation, spreads to individuals in whom the tendency is lying dormant.

• More closely associated with imitation than with any other

instinct, rivalry gets its chief encouragement in games and plays, and, when so used, is not to be too greatly inhibited. However it must be regulated. Competitive activities should be graded and varied. *Give every child a chance to succeed at something, and allow no child to concentrate too strongly upon the thing at which he excels.*

The best type of rivalry is rivalry with one's self, and this means that ways must be found for giving confidence to those who get discouraged because they are not the leaders. In approaching this problem the teacher should remember that each child has some potentialities for leadership, and, in order that these potentialities may be discovered, some scheme should be evolved that will bring all the group into fair competition. As a safeguard, *individual progress charts, kept by the children themselves, should be utilized.*

Gregariousness.—The tendency of human beings to gather in groups is common at all ages. To the infant it is highly necessary, for his life depends upon association with adults, but we find its more obvious prompting in uneasiness when the individual is left alone.

Starting with a tendency to cling to others for protection, the child soon forms habits of seeking the company of others, and his associations vary all the way from "chumming" with one to "gang-ing" or "clique-ing" with several. The tendency is thus reinforced by habit.

The first of these tendencies, chumming, runs throughout the school years. Fast friendships are formed between children, and this is good in the sense that the child's nature may be fully developed thereby; but there are two drawbacks: wider association with others is denied, and one chum may dominate the other to the point where initiative is dissipated.

The second of these tendencies, "gang-ing," develops in

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the years prior to adolescence and frequently engenders vicious and criminal activities. Allowed to take its natural course, "gang-ing" has nothing in its favor, but the school is in a position to utilize this tendency to the full.

To make the best use of both these tendencies, *organize extra-curricular activities, such as 4-H clubs, scouting, and literary societies, and see to it that children who chum together to the exclusion of others are drawn into these. Coöperation is sometimes secured by isolating from the group for a time the child who fails to coöperate.*

Mating.—The mating instinct is an example of a tendency which does not develop or mature so early as others yet has definite survival value. Without it the race would die out.

A small number of children are attracted to the opposite sex but this instinct does not manifest itself strongly before the age of adolescence, in which it involves both the sex instinct and the emotion of love. The latter we shall discuss under the subject of emotions and may limit our discussion here to the sex instinct.

Ordinarily the sex instinct passes through three stages, as follows:

(1) The juvenile stage in which the boy takes an interest in his own appearance, taking care that his teeth are clean, his hair combed, his clothing immaculate. He has developed an interest in one of the opposite sex. The girl exhibits these same signs, but is more careful that her instinctive interest is not detected.

(2) The stage of revulsion in which the boy or girl inhibits sex attraction in the interests of personal welfare—occupational opportunities, moral and religious problems. Sometimes, thoughts busy with these matters, there is intense⁴ resentment against members of the other sex.

(3) The actual mating stage in which marriage is the thought uppermost in mind.

The first and third stages are directly connected with the sex instinct, in that the urge of sex is at the basis of their development; and the second stage occasionally has an indirect connection, in that a feeling of revulsion for the opposite sex may cause a loss of ideals and a reversion to instinctive promptings.

The problem of the school here is to do whatever can reasonably be done in sex hygiene and sex education. The possibilities are not many, but the following recommendations may be made:

There should be no sex courses. Other courses, such as physiology, biology, and especially botany, should be used to build up wholesome attitudes, habits, and ideals regarding sex.

Special efforts should be made to keep the child's mind clean and away from any but a scientific attitude toward the subject.

Any advice in sex matters should be given impressively and individually by special counsellors. In such event the individual should be helped to help himself. A simple knowledge of the facts is sometimes sufficient, but boys, as a rule, cannot be controlled through fear; they can be more easily reached by appeal to their better natures or by allusion to sisters or mothers.

FOREGOING INSTINCTS ARBITRARILY SELECTED

Others, from the long lists of instincts frequently given, might be added either to the first group or to the second group discussed here. Furthermore there might be reason for reversing the position of some of the tendencies thus

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divided into classes, but our point is lost if we quibble over a classification used solely for purposes of clarity.

In considering the redirection of instinctive tendencies, two things must be remembered:

(1) No instinct is full-fledged and independent. In what may seem to be a single, specific reaction may be tied up chains of reflexes, related or even opposed instinctive dispositions, and habits.

(2) Instinctive tendencies, like reflex actions, become conditioned by substitute stimuli before the child has reached the age for regular schooling.

These facts do not, however, preclude improvement in the use of pronounced native tendencies, and teachers should do all that is possible to bring about needed modifications. It is folly to assume that nothing can be done. If that were true, each of us would now be living by his instincts alone.

Utility of Instincts.—Taking all of our instinctive tendencies together they serve a variety of purposes:

(1) They provide for bodily functions: eating, elimination, sleeping, and adaptation to changes of temperature.

(2) They insure perpetuation of the race.

(3) They provide the basis for protective and defense reactions.

(4) They furnish the foundation for skillful occupations.

(5) They make possible adaptation to other human beings.

(6) They afford a basis for differences in personality.

(7) They serve the purpose of initiating learning.

Instincts and Impulses.—No consideration of instinctive behavior would be complete without some mention of impulsive action. Technically, an impulse is the effect of the excitement of an instinct and takes the form of an abrupt and

vivid suggestion which results in unpremeditated action. In other words, an impulse is the outcome of an instinct when the latter is not inhibited by thought and will. Let us illustrate:

A child sent by his teacher to a nearby market to purchase some graham crackers for the mid-morning lunch notices a box of red apples near the store counter. He reaches for one, handles it, looks at it quizzically, lifts it to his mouth, bites it. His hunger reflexes and the instinctive tendencies of manipulation and curiosity may be involved, but the act of biting is an impulse.

Two conditions may follow this impulse. Other impulses, according to the nature of succeeding stimuli, may overcome the first; the child may put the apple back in the box or throw it away. Or inhibition, either through some previous experience or from signs of disapproval from the clerk, may cause the first impulse (to eat the apple) to disappear or take some other form.

Inhibition.—To get clear on just what is meant by inhibition, let us go back for a moment to our discussion of stimulus and response. When a nerve current from a stimulus reaches the muscles and glands, response, especially in the lower centers, is the usual consequence. The higher centers of the brain, however, do not make response easy; rather at times they check response; and this checking of response we call *inhibition*. In the developed mind it is characterized by deliberation and decision. It shuts off many natural responses and sends nerve currents out into new channels where they establish new association pathways.

THE INHIBITED IMPULSE

All native tendencies are likely to find expression through impulses, and certain types of impulsive action are undesir-

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able. For these there are various means of inhibition—by modifying the instincts out of which they come. Among the means are: (1) punishment and reward; (2) substitution (of a desirable for an undesirable reaction); (3) sublimation (the cultivation of intellectual interests and ideals of social service to offset the native tendency); and (4) change of environment or change of stimuli.

However, not all impulsive action is bad. Sometimes it results in creation, and is so linked with the development of ideals that we must be cautious in the exercise of inhibition. At this point, therefore, we may suggest that the teacher *distinguish between impulsive acts characterized by kindness and sympathy and those which subtract from the common good*. Further, the teacher should *take advantage of every opportunity to develop ideals by directing impulses into channels of idealistic behavior*.

QUESTIONS AND PROBLEMS

1. By original example, show how the stimulation of a sense organ produces a response.
2. How many classes of muscles have we? What are they? By examples, show the difference between the duct and ductless glands.
3. What is a *synapse* and how is it produced?
4. Define reflex action and give examples of "pure" reflex.
5. By examples, show the difference between protective reflexes and regulative reflexes.
6. What is a modified reflex action? Illustrate.
7. Differentiate between a simple reflex and a compound reflex.
- * 8. Give an original example of a secondary automatic reaction.
9. Define, in your own words, a conditioned reflex.

10. Describe Pavlov's experiments and show how they were utilized by Krasnogorski.

11. What did Lashley find out about the stimulation of the salivary glands?

12. What were the three conclusions arrived at by Matcer in her experiments on the conditioned reflex?

13. What was Hudgins' contribution to the work with the conditioned reflex?

14. Distinguished between a delayed reflex and a memory reflex.

15. What values are there to education in the methods used in conditioning reflexes?

16. Distinguish between an instinct and a reflex.

17. With respect to function, what three classes of instincts are ordinarily given?

18. Show how the instinct of expression develops and how it is best modified.

19. What is meant by manipulation and how is it utilized in education?

20. How is the instinct of curiosity to be redirected?

21. Show how the five kinds of imitation may be exemplified by the school child. What direction should be given this tendency?

22. How is the tendency to play best used in the schoolroom?

23. What two forms does the fighting instinct take and what recommendations are made concerning them?

24. Show how self-assertion, acquisitiveness, hoarding, and rivalry all are related and are best modified.

25. Several boys in the sixth grade organized a gang, played together to the exclusion of all other boys, devised ways for antagonizing the teacher, and finally destroyed some school property. The leader of the gang was socially somewhat more mature than the others. If, as a teacher, you were faced with such a situation, what would you do? Point out the possible solutions.

26. What are the recommendations in connection with the redirection of the mating instinct?

27. What is meant by the statement, "an instinct is not full-fledged and independent"?

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28. Indicate seven purposes which instincts serve.
29. Where does inhibition take place and what is its purpose?
30. What is an impulse? Give an original example of an impulse which "may lead to creation."

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CHAPTER II

The Building of Habits

We have been speaking of reflexes and instincts as inborn tendencies to respond—spontaneous types of behavior. Habit also is a spontaneous type of behavior; it often develops from reflexes and instincts; but it is acquired. It therefore calls for separate treatment and the purpose of this chapter is to show: how habits are formed, their relationship to learning, the services they give, their possibilities of transfer, and the best methods for building right habits.

HABITS AND NATIVE EQUIPMENT

Our habit reactions are based in a coöperative arrangement of the nervous system. The neural arc, established when a sense organ is affected by a stimulus, comprises a pathway in the organic structure and over this pathway nerve currents continue to go when stimuli of like character are received.

Reflexes and Habits. —A succession of nerve currents over the same pathway lowers synaptic resistance and finally causes response to become automatic or spontaneous. Some habits then, are formed from the repeated action of unconditioned reflexes, but, to survive, the pathway must be used over a period of time else synaptic resistance is restored.

Some of our habits, though, are not to be accounted for so easily. Watson insists that a habit results from a complex

system of reflexes functioning in serial order, with the pattern acquired, and objective psychologists generally have leaned to the view that *all* habits may be explained as groups of conditioned reflexes. Conclusion on these points is made difficult by two facts: (1) from earliest infancy some reflex activities cease to function in one situation and become habitual responses in another; and (2) not only may conditioned reflexes be inhibited by extraneous stimuli but they tend to disappear without frequent reinforcement by natural stimuli.

Reception in Habit Formation.—In the acquisition of habits we use the eye and ear far more than the other receptors. The eye, particularly, is used wherever possible, and, with this fact as a starting point, it should be very easy to account for habit formation on the general hypothesis of stimulus and response.

Take, for example, the motor habit of catching a baseball. The eye receives the stimulus of the approaching ball, sends nerve currents over the optic nerve to the cortex of the brain where they are transferred to motor nerves in the arm and hand, the latter responding by the act of catching the ball. The connection once made, the act not only is facilitated through repetition but may become automatic.

It may be, though, that the cortex is not always needed in the process. Franz, working among insane patients, has been able to build up groups of habits, such as speaking, knitting, sewing, and playing baseball, in individuals with serious destruction of brain tissues, victims of aphasia and paralysis. In animal psychology Franz and Lashley each has shown that one-third of the cortex of a rat (excluding the motor area) may be cut away without seriously interfering with habit formation; while Marina, experimenting with apes, eliminated the muscle moving the eye outward and sub-

stituted therefor a muscle which lifts the eye upward, without perceptibly changing the animal's habits. Marina concluded that the anatomical association pathways from the centers to the muscles are not fixed.

The general conclusion to be drawn from these experiments has already been indicated, in connection with our discussion of localized areas of the brain: when certain parts of the cortex are impaired, habits controlled by those parts are lost but may be re-acquired and new ones learned.

It may be we shall find that the brain is capable of widespread adaptation to sensory stimuli. We must assume, however, that, in man, disturbance of sensory areas will invariably bring interference to habits already formed. In the light of such assumption, the theory of stimulus and response serves as a guide in showing how habits are formed, and we may think of some habits as outgrowths of unconditioned reflexes and of others resulting from conditioned reflexes arising either from the accidents of environment or from purposeful substitution.

Instincts and Habits. —Habit differs from instinct not only in the fact that it is acquired but in that it makes possible greater and more widespread adaptation to changes in environment.

It is not the difference, however, but the similarity that sometimes brings confusion. When a habit is perfected, it functions in the same way as an instinct; it becomes a *tendency* toward action and, through repetition, becomes spontaneous.

GENERAL SERVICES OF HABIT

Habit, of whatever origin, is a strong force in the life of any individual. It is, as has often been said, his best friend

or his worst enemy ; but, whatever general direction it takes, it serves the purpose of economizing time and energy and of securing skill and efficiency.

Habit Simplifies Movements.—Any one who has ever driven a motor car realizes at once the strength of habit in performing the necessary mechanical operations. In the first few trials everything is new, strange, and awkward. The ignition key must be turned, the clutch-pedal depressed, the starter set into action, the clutch engaged, the gear shifted, the accelerator depressed. The movements are complicated, the driver's responses slow and uncertain. After some practice, however, movements are simplified and the necessary actions become automatic until, as in the case of the chauffeur of long experience, the whole process is accomplished almost imperceptibly.

Habit Provides Accuracy.—No better example of the service of habit in providing accuracy is afforded than that of learning to use a typewriter. Give the tyro a simple word to spell—for example, *this*. He looks over the keyboard, finds each letter and strikes it slowly and heavily. Through practicing the word he increases both his speed and accuracy until, presently, he is able to write a sentence without too many mistakes. Ultimately he may be able, with the use of but two fingers, to become so habitual in the use of the typewriter that errors are infrequent, and we know, of course, that the trained stenographer becomes so proficient that she can copy page after page of material without error and without knowledge of the actual content of the material.

Habit Diminishes Fatigue.—Learning to dance offers a good example of the diminishing of fatigue when the right

habits are perfected. In the early lessons, particularly in tap dancing, one tires readily and the muscles get sore and stiff and refuse to respond in the desired manner. Later the activities become so habituated that the dancer no longer tires and the muscles react as if dancing itself were the easiest thing a person could do. The professional tap dancer sometimes responds to a dozen encores, while the marathon dancer seems to be able to go on forever if he may catch an occasional nap on his partner's shoulder.

Habit Economizes Energy.—One of the great values of habit is that it cuts down the amount of energy one puts into his activities. The game of golf serves as an illustration. The "duffer" remains a "duffer" because he has not perfected the right golf habits, and the right habits are to be gained only through "good form." A good stance means not only proper placement of the feet before the swing is made but such distance from the ball that the club-head will strike the ball squarely and follow through on each shot. The "duffer" wears himself out swinging at the ball and chasing after it when it goes into the rough. He is usually fatigued at the end of nine holes while the "real" golfer seldom tires. We say the latter has a "natural swing," almost effortless. He economizes energy because he has formed the right habits, and is able to play as many as thirty-six holes in a day with a relative amount of freshness.

Habit Supplies Routine.—The work of the postal clerk illustrates what habit gives in the way of a definite, routine manner of performing tasks. Several times a day he receives large bundles of letters and papers which must be distributed in boxes or in bags without error. In the early days of forming the habit he must stop to consider each address

on letters, boxes, or bags, but, as time goes on, he is able to make the distributions without mistake and with clock-like regularity. At times, other than rush hours, he is able to carry on a conversation while distributing mail; it has become a routine matter.

CAN HABITS FUNCTION SIMULTANEOUSLY?

The illustration just given raises the question: Can several habits be carried on at the same time? It is pointed out that women can sew and talk simultaneously, that a telegraph operator is able to talk while sending a message, that pianists and stenographers are also so accomplished, and that expert handwriters have been known to sing, whistle, or carry on conversation while writing.

The answer to the question is this: If the habits functioning together have been learned together they may be carried on simultaneously, otherwise not; and habits which require fine coordinations must function alone. An example of the latter, drawn from the above illustrations, is the habit of putting well on the golf green.

Classification of Habits.—Although there is some overlapping, the classification of habits may be narrowed down to the following two groups:

(1) *Explicit* habits—overt acts which may easily be observed, such as walking, talking, writing, or working at a vocation.

(2) *Implicit* habits—habits not to be seen without the aid of instruments, such as those involving the throat, tongue, and larynx; habits of thought; and habits which are present but not functioning.

In education we try to add to the explicit and implicit habits the child has already formed.

Building Explicit Habits.—In training the child in explicit habits we train him in motor, i.e., muscular, response, or, in other words, in habits of skill. We continue his early training in walking, talking, eating, and playing, and we teach him to write, sing, and work with a measurable degree of precision.

The trunk muscles which develop first and with which, in correlation, are developed the vital organs of life, we continue to exercise in order that good posture may be maintained and the abdominal organs allowed to function naturally.

Then come the smaller muscles of the body, the muscles which accomplish fine coördinations. These are of special significance to us in education now, for the changes which have come about in adult activities threaten the health and strength of the circulatory, respiratory, digestive, and excretory systems. We require less use of the smaller muscles than formerly but, if vitality is to be preserved, sufficient margin of motor activity must be maintained and the building of right habits in these directions must continue.

Building Implicit Habits.—We build implicit habits indirectly by training in explicit habits which we expect to become implicit. For example, in youth we teach the child to observe fire drills, not that the habit may continue to function with regularity but that it may return in the form of spontaneous response when needed.

Again, we take the implicit habit imperfectly formed and attempt to perfect it in order that it either may become immediately explicit or may survive as perpetual learning. In this we are aided by the fact that a habit once learned and lost is more easily relearned than if it had never been learned at all. The school child whose habit of concentrated atten-

tion has been imperfectly formed will have loosened, during a summer of free play, whatever grasp he may have had upon it. He is sure to have difficulty, when school opens in the autumn, in picking it up again, but not so much difficulty as at first experienced.

HABIT AND LEARNING

The relationship between habit and learning is twofold. In the first place, habit often results from learning, and, in the second, it makes more learning possible. Effective learning, therefore, is largely a matter of building right habits. Let us see how this works out.

1) **Learning by Trial-and-Success.**—There are several methods of learning, the simplest of which is that by trial-and-success. In this the individual tries one thing, fails, tries another, then another, until at last he strikes upon the act or procedure which will bring success. A good example is the common experience of trying to solve a puzzle by testing out all the various possible combinations.

(From earliest infancy the child uses the trial-and-success method in learning to make muscular movements) He tries out his arms, hands, legs, feet, and vocal organs until finally he learns to make nearly all the movements possible to these.

Laws of Learning.—The amount of learning by such method would be negligible, however, if it were not for the ability to form habits, and habits are formed in accordance with four laws of learning which may be stated as follows:

(1) *Frequency.* The more frequently an act is repeated, the stronger the connection between the stimulus and the response.

(2) *Recency*. The more recently an act has been performed, the stronger the connection between the stimulus and the response.

(3) *Effect*. When an act is satisfying it is repeated; when it is annoying it is avoided.

(4) *Readiness*. When a connection between a stimulus and a response is ready to act, to act is satisfying and not to act is annoying.

Law of Frequency.—From the law of frequency we may gather that continued practice will not only perfect a habit but will bring about improvement in its use; but this is not altogether true. Mere repetition is no guarantee of improvement; if the repetition is exact, there can be no improvement. Taking examples from adult activities, the stenographer, the telegrapher, and the linotype operator not only try to build habits of accuracy but habits of speed, and increased speed would not result if the same acts were exactly repeated.

So it is with the child in the classroom. He improves because he is given opportunity to vary his acts in slight particulars and to derive satisfaction from variations, thereby improving his abilities along specific lines. Thus only can repetition be justified.

Law of Recency.—If a habit is to be perfected, recency in experiencing the activity is sure to be a factor. Let us take for example the explicit habit of writing. A child who, within a few hours, has had practice in writing the word *minimum* will not have so great difficulty in forming distinct letters because there is a lingering excitement of peculiar tracts in the brain that takes some time to die out. If days, weeks, or months elapse between periods of drill in forming *m*, *i*, *n*, and *u*, the connection must be made anew. Difficulty

is sure to be met not only in forming the letters but in making the right letter combinations.

However, we must make two exceptions here. In the first place, learning sometimes goes on in spite of recency effects. A child may have been taught a certain method in making computations in arithmetic. Assuming that the habit is not perfectly formed, the teacher may discover that the child has either learned a new method, despite the recency of his training, or has learned steps in advance of the method given. If so, trial-and-success will have been responsible, the right answer to the problem being sufficient stimulus to initiate a related but new habit.

Again, recency must not be accepted as infallible in point of time. The teacher who is trying to call to the mind of the child some exact procedure in yesterday's work may accomplish no more than to call to mind some experiences of a year or two ago.

Law of Effect.—We may conclude from the law of effect that responses which satisfy some want grow into habits, and that responses which annoy (do not satisfy a want) do not grow into habits.

Through inborn urges the child acts only to satisfy his wants, and, throughout his life, his learning is motivated by these urges. All the way along his wants must be utilized, first to get him to make responses and then to make the responses satisfying.

The trouble here is that not only do his wants change from time to time but he acquires desires, some of which are in opposition to profitable learning. We cannot, therefore, rest on the assumption that, in order to properly educate, we must satisfy all wants.

Want and Desire.—In using the terms, *want* and *desire*, a fine shade of difference should be drawn.

A want is a spontaneous, or mechanical, urge immediately resulting from the activities of the nervous system. When one is hungry he is sure to *want* food of some kind.

A desire is a conscious wishing, longing, or yearning for something, resulting from the intellectual processes which grow out of mechanical reactions. When thinking of tomorrow's meals one may *desire* better food.

In other words, want forces habit; desire reinforces it.

Law of Readiness.—Being consumed with urges and wants, the child is ready to react in some way at all times. He has urges to express himself, to manipulate objects, to be curious, to imitate what he sees, to play and to fight, to assert himself, to acquire possession of things, to outdo others, and to be one of the crowd. Some of these tendencies are always in evidence and may be used as the beginnings of habit. On the other hand, habits already acquired may be used to secure readiness for activities to be developed. Such acquired habits also help to determine wants, and one of the duties of the school is to develop proper wants by first developing habits that lead to them.

The need for the latter is shown in the relationship between readiness and ability. If a child has the aptitude (muscular speed, strength, and mental maturity) to learn, readiness for an activity may be developed, and thus may readiness precede the ability to perform. But readiness does not always precede ability; it sometimes is derived from the presence of ability. For example, a child may be ready to take part in a game of basketball because he has already learned to dribble, pass, and shoot for the basket.

Laws of Learning and Trial-and-Success.—No matter what factor of advantage may be present—frequency, recency, effect, or readiness—there is sure to be much trial-and-success learning at any age. The fact is, in most activities, we encourage it rather than discourage it. To get the child to take a chance on an outcome is to get him to exercise the will and to carry out purposes, and it is a method which should not be shunned in initiating any learning activity.

Purpose and Will. —As in drawing a fine shade of difference between the terms, *want* and *desire*, we should make some distinction between *purpose* and *will*.

Purpose, says Woodworth, is a set for a certain activity with a *foresight of the result of that activity*. It grows out of reflexes and instincts, but, to use the words of James, it is really consciousness fighting for ends. It sets up goals and, reinforced by will, results in voluntary selection. It makes possible the formation of habits. Without it, man would be no more than a bundle of reflex actions and instinctive tendencies. With it, though, he can select habits to be formed and shut off instinctive tendencies that might lead to undesirable habits.

Will, says James, is a faculty of effort born in us. That it is born in us any one who has walked the floor at midnight carrying a head-strong infant will testify. The strength of will is determined by the organization of the nervous system and has its limits, but the uses of the will can be improved.

The place of purpose and will, functioning together, is between instinct and habit. Let us illustrate. In imitation of adults, the baby blows at a lighted candle, but he cannot blow out the candle unless he is taught how to do it. In being taught how to do it he is coached to try and, in trying, he

blows with a purpose. He exercises the will in blowing; he determines to blow it out, and the mechanism of habit has been initiated.

In education we provide purposes for the initiation of habits. When the child lacks an incentive we supply one; and we do this so well, on the average, that when he grows to adulthood his incentives are strong. If he is to free his latent energies and reach the maximum of his abilities, a definite purpose is necessary. The goal which we set up for him, therefore, is not only vital to him; it is one which he can attain. To help him attain it we encourage the use of will, urge him to practice, and tie up with will the natural tendencies of self-assertion and rivalry.

Learning by Insight.—To say that we learn by trial-and-success is but another way to say that we learn by doing. We do learn by doing, i.e., the trial-and-success method dominates, but we are aided by insight, a method of learning championed by gestalt psychologists. Gestalt psychologists believe that there is a certain degree of orderly arrangement in sensory data to which one may respond without previous learning, i.e., he may learn by patterns or total organizations.

A good explanation of insight is offered by Koffka. If one knows that he is to remove a ring in a certain puzzle, and that, in order to do so, he must first move this piece and then that, turn the puzzle over and do something else, his procedure will be said to possess a greater degree of insight than that of another person who simply goes ahead without any plan at all. But if one also knows that the ring is connected in such and such a manner with such and such parts of the device, and that these are again to be turned so and so, his procedure will indicate still greater insight.

Possibly insight is the result of a lot of trial-and-success learning. Sándiford suggests this possibility when he speaks of it as an instance of rapid learning; but, from whatever source it comes, our learning is greatly hastened by it.

To show how insight is developed in children we may show that in building habits we try to do three definite things: (1) satisfy wants or create others as substitutes; (2) improve each habitual act by permitting variation in repetition; and (3) utilize both native readiness and acquired readiness in developing motor and mental skills. When these things are accomplished successfully a certain degree of insight or discernment is sure to be developed in the child. Through satisfying wants we help him to acquire habits easily; through permitting variation in repetition we lead him to see a habit as a whole; and through causing him to acquire readiness we teach him to take short-cuts to the desired response. Presently we find that many actual motor responses have been eliminated and that speed of learning has been greatly increased through insight.

Learning by Observation.—Learning by insight implies learning by observation. By observing the general plan of a puzzle, we are able to take short-cuts and, if we follow observation by immediate manipulation, we gain practical mastery and learning is effective. Learning by imitation is nothing more or less than learning by observation followed by trial-and-success. Observation is essential to all learning. Even a good theorist, says Darwin, must be a good observer.

The eye, in the acquisition of habits, we said, is used wherever possible. We naturally include observation therefore as a factor in habit building. In fact, we desire to build habits which lead to accuracy, and it is through practice in careful observation that accuracy is secured.

The child's training in observation is to begin with exactness. ~~He is to be taught to observe independently and not depend too much upon words and suggestions.~~ He is to be taught to trust his senses and to learn accuracy in perceiving, and he is also to be taught to be accurate in relating what he has seen. If these things are accomplished, habit building will be facilitated in two essential respects.

Learning by Thinking.—Observation is essential to thinking. When we think we remember things we have seen, put together facts previously observed, and reflect on problems not immediately represented by concrete materials.

In thinking, adults naturally have an advantage over children. They adapt themselves more promptly and get a better start toward the solution of problems because they have a better understanding, a better plan, and tend to hew to the line more than children.

This may be illustrated by another reference to the puzzle. In the ordinary puzzle, children, on the first trial, will average thirty-five errors to ten for adults, and this ratio will continue, with slight variation, until the tenth trial, when matters are evened and continue practically so throughout succeeding trials.

The process of teaching the child to think will be taken up in detail in a succeeding chapter.

HABIT FORMATION IN ADULTS

In the adult most of the habits formed are dependent in part upon habits previously formed. This is an advantage in that it permits selection of habits to be formed, but it is also a disadvantage in that the adult's muscles are so fixed that new modes of activity are acquired with greater difficulty.

Not that it is entirely impossible for the adult to form a new habit. Men of forty or older have been known to acquire habits, but the habits are short of perfection and require greater effort to perpetuate.

In this connection Watson has formulated three tentative laws for habit formation which may be stated as follows:

(1) The younger the individual the more rapidly the habit will be formed.

(2) Any given habit will rise more rapidly if not many habits have been formed simultaneously.

(3) The higher the incentive and the more uniformly it is maintained the more rapidly the habit will be formed.

Thus the child has the advantage of the adult in two respects: his youth, and his lack of habits formed simultaneously; yet the adult is likely to have a higher incentive and to maintain it longer.

HABIT AND INHIBITION

The higher centers, we said, do not make response easy, but tend to check response. By checking responses we prevent or overcome certain types of activities, and our success depends in no small measure upon the power to check or inhibit. What in any situation we are restrained from doing, says Royce, is as important to us as what we do.

In a day's time countless stimuli reach the higher centers. Should it be necessary to react to each of these, the individual's nervous system soon would be destroyed. Fortunately it is not necessary; the higher mental processes are inhibitory, and this, incidentally, may explain learning by insight. Inhibition makes it possible for us to avoid becoming "creatures of habit"; it forces habit to serve the better ends of life while, at the same time it acts as a selective agency in per-

mitting those habits to survive which seem, at first glance, to carry the greatest potentialities.

HABIT AND DESIRE

Purpose prompts the individual to seek goals, and desire, the outcome of the drives of the nervous system, sends him forth. He desires this and he desires that. Presently he is surfeited with desires that cannot be realized. He lessens their number by building new habits or by weakening those already formed. He hesitates, vacillates, or rejects his purposes; and purposes rejected sometimes come back in the form of "defense mechanisms"—alibis or sour-grape attitudes. On the other hand he may build habits of desire in specific directions, to be realized in proportion to the strength of the habits. We tell him that he may have anything he wishes if he wishes for it hard enough, but this can mean only that habit building must be pointed in the direction of the thing desired.

TRANSFER OF HABIT

Although, as pointed out in connection with their classification, the kinds of habits overlap, there is no such thing as a general habit. We do have habitual attitudes, but these are made up of a number of specific habits and are not, in a real sense general habits. Is it at all possible, then, for one habit to carry over to another? We know that the presence of many well-formed habits will bring about the formation of more, and that the presence of some perfectly-formed habits will shut off others in the process of building. What, therefore, is the answer?

Theory of Identical Elements.—The answer is this: The

first habit will transfer to the second if elements in the two are identical.

For example, if a child, after several trials, masters a puzzle and is handed another in which the same principle is involved, he is likely to master the second with ease through insight; but, if he has worked the first puzzle without seeing the principle, there is little or no carry-over.

Again, a good ice skater is not necessarily a good swimmer, but a good ice skater does not meet with great difficulty in learning to roller-skate.

Again, a good student of Latin is able to learn the Romanic languages (Italian, French, Spanish, Portuguese) with relative ease because these are built upon the Latin; but, to be a good student of Latin, guarantees little in the matter of learning German.

HABITS FORMED WITH EASE

With paths of least resistance provided by nature, with instinctive promptings pointing the way, and with purpose and desire beckoning the individual to follow the paths of least resistance, the formation of habits is a relatively easy matter. Once perfectly formed, they cannot be broken.

The problem of the individual's education, then, is comprised of two parts: (1) to cause him to form right habits; and (2) to substitute some for those he has already formed, those that will prove to be undesirable and unserviceable in later years. For the solution of this problem we have several rules for habit building.

RULES FOR HABIT BUILDING

All that has been said above may be covered by seven rules for the building of right habits, the first two of which were

first advanced by Bain and the second two by James. The four are paraphrased here and three other rules added. Let us state each rule in turn and discuss it briefly:

1. *Cause the child to set out with a strong and decided initiative.* Any activity that is to be used as the beginning of a habit must be entered into whole-heartedly. To get the child to do this, the teacher must give him a clear idea of the activity to be begun.

Usually a demonstration is necessary, and, from the standpoint of explicit habits, "setting-up exercises" afford a good example. In these, if the child is to make proper muscular coördinations, he must first see the thing done.

In presenting "setting-up exercises" let us assume the use of a count of six. The teacher begins by demonstrating the complete exercise: (1) forward raise; (2) sideward move; (3) upward raise; (4) shoulders place; (5) hips place; (6) arms down. A small percentage of any unselected group of children will be able to repeat the entire series through *observation* of one complete demonstration. Such children learn by "wholes," through *insight*. For the majority, though, the movements must be taken one at a time. While they are *natively ready*, they have not acquired readiness, due to lack of experience in these and related exercises. There will be, therefore, much *trial-and-success* learning, and a small percentage of the group will make more errors before any of the movements are perfected, if indeed they are ever perfected.

The teacher drills the group in each movement in its sequence and, for the child who does not get the idea immediately, the movement is repeated. To hold the attention of the group, the activity must be made interesting—either something pleasant to do or something which will lead to pleasant results (law of effect). Finally, the children must

be encouraged to try hard (use the *will*), vie with (*rival*) the other children, and to excel if possible (establish an incentive, a *purpose*).

2. *Never let an exception occur.* To see the importance of this rule one need but look back upon the early years of his own schooling; inadequacies in speech and simple business practices are often attributable to exceptions he was permitted to make in learning the formal school subjects.

In applying this rule, let us take the habit resulting from learning to spell a word correctly. The teacher writes the new word on the blackboard for the child to observe carefully. Then she pronounces it distinctly; defines it; uses it in a sentence or has the child do so; shows the syllables into which the word is divided; has the child write the word on practice paper several times, spelling it as he writes; and allows him a minute to look at the word on the board, then asks him to close his eyes and try to visualize it.

It will be seen at a glance that here the teacher is trying to build a habit by conditioning the responses of the child. In pronouncing the word, defining it, using it in a sentence, and in having the child write it, spell it, and visualize it, she is setting up systems of synapses that will grow accustomed to working together.

There are, of course, old pathways which interfere with the building of the new, but the teacher, in employing the method outlined, makes sure of the use of the new by resorting to every means for creating right impressions. The eye, the ear, the hand, and the mind are called upon to grasp and clinch the proper spelling of the word. But the teacher does not stop there; when the child writes the word on practice paper or spells it aloud after visualization, she sees that he does it in the *right* way each succeeding time. By allowing no exceptions, the habit of spelling the word correctly is,

broadly speaking, securely rooted and an implicit habit established.

3. *See that the child seizes the first possible opportunity to act on his resolutions (purposes) and promptings (urges).* Every impression, as previously stated, must have its correlative expression. We recognize that fact by insisting upon some motor expression in connection with each habit to be built. But also we must watch for signs of inner prompting and for signs of resolution that indicate that purpose is functioning, whether or not we have intentionally provided the stimulus. When these signs appear, we should insist upon prompt action in order that the habit may be facilitated and clinched.

Let us take for example the habit of reading aloud. The teacher observes that a child is trying hard to read with "expression," feeling and understanding. Instead of permitting the other children to ridicule his unusual performance, she encourages him to continue and invites his attention to those points in the selection where his emphasis has been just right.

If she fails to do this, the child's emotions, to use James's way of putting it, are allowed to evaporate, and they will get into a way of evaporating, thus forming habits in a negative direction.

Some emotions, as we shall show later, should be controlled and inhibited, but some, on the other hand, are important contributing factors in habit building: such, for example, as those which function in creating habits of appreciation of good literature and the fine arts.

4. *Cause the child to use the habit by giving him a little practice in it each day.* Obviously no habit is built without repetition (law of frequency). But we must qualify. In the first place this means attentive repetition; as Thorndike

says, there must be a sequence of time *plus* belonging; the child must make the activity *his*. In the second place repetition must not be so exact that there can be no improvement.

With these qualifications we may say that desirable habits cannot become permanently fixed without the use of drill—not in the narrower sense of practice in exact duplication but in the sense of the development of skills, knowledge and attitudes.

There are some habits, of course, which, for immediate purposes, require what seems to be exact repetition, and sometimes these are distasteful to the child, i.e., they operate against the law of effect as used in building habits. He must be taught, for example, to scrape the mud from his shoes, to march in line, to salute the flag, or to cease his playground activities when the bell rings. Improvement in skills here may reach periods of no progress, in which case drill should be re-motivated; i.e., the child should be given a new incentive for practice in each habit.

It will be noted in this connection that the child ordinarily makes his most rapid improvement in any habit during the early stages of practice. This is due to several factors: to interest and effort, to abilities already acquired, to the fact that the easiest elements are likely to be mastered first, and to the fact that, as more and more connections are made, more time is taken up in keeping these connections functioning.

We can see these factors operating in drill in the fundamentals of arithmetic. A child being taught to add or subtract may make relatively steady progress at first, influenced, of course, by his degree of interest, desire to do well, self-confidence, emotional tone, condition of health, and amount of concentration; but he may reach a point where drill ceases to bring about improvement. It is here that the teacher must permit variation in slight particulars and to see that satis-

faction is gained from variation, such as is derived from the introduction of new number games. But it must be kept in mind that, where improvement in knowledge and attitudes is sought after, daily exercise of habits, employing both frequency and recency, is mandatory.

5. *Attempt to "break" the undesirable habits the child has formed by the substitution of better ones.* The fact that the child is potentially ready to form habits means that, long before he will have entered the directed school, he will have acquired habits of many kinds. From the standpoint of the common good, some of these are sure to be undesirable, and, because some will have been highly developed, they will make adaptation to new situations difficult.

Here, then, is the task of utilizing previously formed habits in the development of proper wants and desires. The old perfected habit, as we have said, cannot be completely "broken." It is fixed, regular, spontaneous, accurate, easy, and satisfying. The new habit we demand of the child is exploratory, slow, uncertain, and unsatisfying. It demands effort and strained attention.

The child who has formed the habit of saying "He done it" will find the expression "He did it" awkward and uncomfortable at first; the old habit will reassert itself, and his effort to break it down will ordinarily result in such expression as "He has did it."

A counter-habit must be formed, however, and it must be strong and positive, as well as satisfying. To help make it strong and positive and satisfying, we have the following rule.

6. *Arouse and sustain interests in the building of habits by providing motives for their perfection, and make these motives plain to the child as opportunity arises.* To give the child the clear idea is not enough; he must have a personal

motive, must be able to see some personal gain in the perfection of the habit. Naturally self-assertive, emulative, or desirous of social approval, he is ready for an incentive that will lead to a high standard of skill, while his tendencies toward gregariousness may be utilized in developing habits of cleanliness, scholarship, and coöperation.

Not always is there time to explain the motive for beginning an activity, but, where time and understanding permit, a careful explanation of purpose will not go amiss. A hammer is wielded much better if it is known that the little houses we propose to build are to protect the birds from the cats and the weather, and habits of promptness are more easily inculcated if the motive (high standing of the grade in the school) is made plain.

7. *Prevent undesirable habits by shutting them off before they can get under way.* The best first evidence of undesirable habits will come in the form of impulsive action. Impulsively the child will spell a word as it "sounds," will reply that 5 times 2 equals 7, will answer "Huh?" instead of "Pardon me?" Impulsively, also, he may steal, harm, or wantonly destroy.

Often these are spontaneous responses arising from tendencies which have not yet reached the habit stage. They should be cut off before they are repeated. Explain to the child the root form of the word and how it is made up; show him the difference at once between the process of adding 5 and 2 and that of multiplying 5 and 2; stress the need for polite reply by stressing the surety of social approval; and show him that to steal, harm, or destroy leads to unprofitable consequences. If he is typical, habit tendencies along these lines will be rather easily dissipated.

We have been speaking of building habits. The question arises: what kind of habits should be formed?

KINDS OF HABITS TO BE FORMED

We have classified habits into two groups: explicit and implicit. Here we may introduce another classification—habits of hygiene: physical, mental, and moral.

Habits of Physical Hygiene.—Habits of physical hygiene start with habits of cleanliness. Nothing quite so well creates a feeling of self-respect as the knowledge that one is clean; but habits of cleanliness are difficult to fix; and, moreover, the task of building some of them is not directly within the province of the school.

However, the child may be given incentives for bathing frequently and for keeping his face, ears, neck and hands as free from dirt as he can. Further, he should be trained in the care of his teeth and eyes, and in correct breathing, posture, and carriage.

In the way of motivation, he may be appealed to through his natural tendencies toward physical activity—play, imitation, and rivalry—his interests aroused through weighing and measuring, dramatization, and competitive health games. He should be given every opportunity to practice health.

Habits of Mental Hygiene.—Habits of mental hygiene are based in action and in work. The child should be trained, says Burnham, to control his activities and impulses, to concentrate his attention on the thing at hand, to make orderly associations and to avoid confusion and interference, to develop an active attitude toward getting the best results in the face of difficulties, to play and work and study with other children, and to act according to his conscience and his sense of honor.

It is well to remember in this connection that there are

two kinds of habits which practically ensure the acquisition of those given above. If a child can be trained in habits of *promptness*, other habits, such as those of control, concentration, orderly association, and persistence, are reasonably certain to follow; while, if he can be trained in habits of *kindliness*, he will be able to play, work, and study with the other children and will be led to do the right thing because it is right.

Habits of Moral Hygiene.—Finally, habits of moral hygiene should be based in the Golden Rule, in fair play. The child should be trained to take his rightful place, sometimes as a leader, sometimes as a follower. If he hasn't learned to do the right thing because it is right, the moral aspect of this mental habit should be made clear to him. Further, he should be taught to coöperate through courteous responses and to hold fast to the best things by building habits of loyalty.

These are general terms and imply a knowledge of the best uses of conscious states and processes; but we shall not be too specific at this point, for not only do we now pass to a discussion of conscious states but later in this volume shall show more exactly how the various habits of hygiene are built. The rules for habit building we shall refer to from time to time.

QUESTIONS AND PROBLEMS

1. In what sense may we say that habits are "acquired reflexes"?
2. What evidence have we that strict cortical localization of brain areas is questionable?

3. In what way do habits and instincts differ from each other and in what way are they alike?
4. Show by example and in detail how habit simplifies movement.
5. Give an example to show how habit provides accuracy.
6. How is fatigue diminished by habit? Also amount of energy used?
7. What is the value of routine as supplied by habit?
8. Can several habits function at the same time? Illustrate your answer.
9. Into what two groups may habits be classified? Give examples of each.
10. In what two ways are habit and learning related?
11. How does learning by trial-and-success lead to habit building?
12. State in your own words the four laws of learning.
13. How do we apply the law of frequency in education?
14. Likewise the laws of recency, effect, and exercise?
15. What distinction is made between want and desire?
16. What distinction is made between purpose and will?
17. How is purpose employed in the initiation of habits?
18. What thread of relationship runs through learning by insight, by observation, and by thinking?
19. How are insight and observation developed in habit building?
20. In what way must we qualify the statement: new habits are impossible to the adult?
21. State in your own words the three laws of habit formation as worked out by Watson.
22. Show how inhibition and desire effect habit building. May habits exist without desires as accompaniments?
23. Give an original example to demonstrate the theory of transfer. What are the limitations of transfer of habit?
24. With respect to habit building what is the problem of the individual's education?
25. Give an original illustration showing how you would start a habit in a child.
26. In what three ways do habits become securely rooted and fixed?

27. A child in your classroom has a well-formed habit of attempting to answer aloud every question asked. How will you go about "breaking" such a habit?

28. Should a child always be given a motive for engaging in an activity? Cite exceptions.

29. Show by example how you would prevent a habit from getting under way.

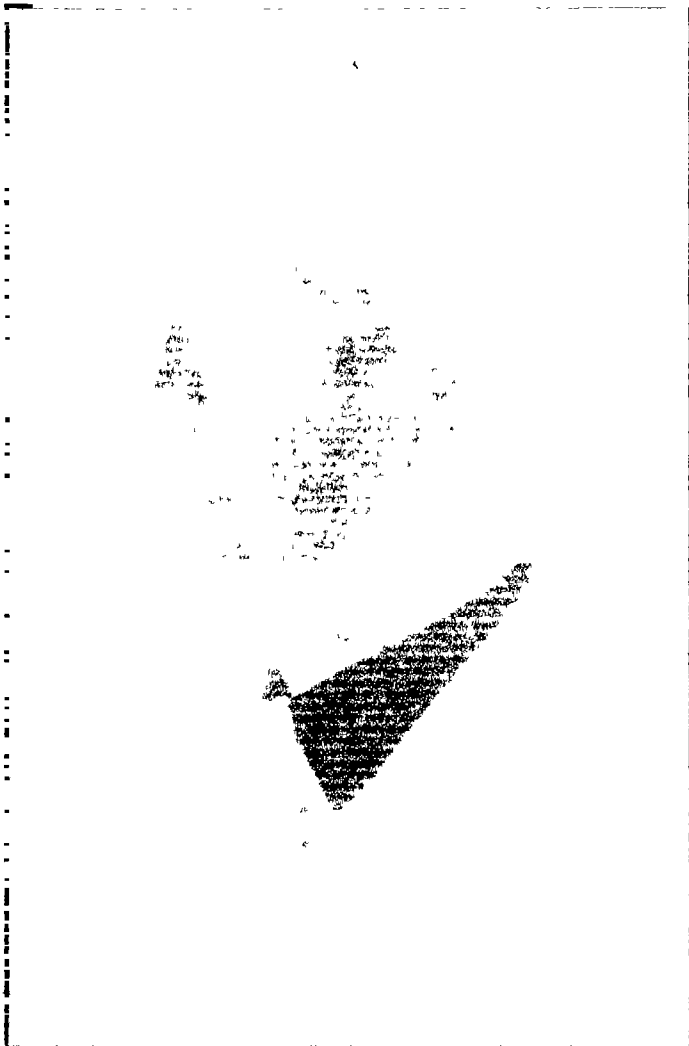
30. Try to show the relationship between physical hygiene and mental hygiene by showing that habits of slovenliness result from unorganized thinking.

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ARNOLD GESELL

CHAPTER III

Redirection of Sense-Perception

We have shown how a nerve current, starting at a sense organ, follows a sensory nerve to the brain and there passes out over a motor nerve to the muscles and glands. The first response of the brain to the external stimulus is called *sensation*. It is the nervous system's acknowledgment of the presence of a stimulus.

However, the conscious process involved in sensation is never complete without *perception*; i.e., the recognition of the stimulating object, or, to put it another way, the meaning we give to sensation. We are able to interpret sensations when they arise. We are able even to localize them.

We say, therefore, that sensation (the first brain response) is mechanical but that perception is conscious, and it is obvious that one does not exist without the other. To describe the whole process we use the term *sense-perception*, meaning, of course, that we recognize the sensation state as a conscious state or process.

Our problem in this chapter is to point out the various types of sensation, discuss their functions, show how perceptions arise, and show what may be done to redirect sense-perception.

TYPES OF SENSATION

The normal individual experiences at least seven types of sensation, five of which—those starting with the sense organs of sight, hearing, taste, smell, and touch—are subject to

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everyday attention and comment. The other two types are known as organic and kinaesthetic (muscle) sensations. (Sometimes the number of sensations is given as ten or more, the sense of touch including a number of differentiated sensations, a discussion of which will appear under the topic of "cutaneous sensation.") In order that we may see how each type arises, let us discuss them by first describing the sensory apparatus responsible for each.

Equipment for Seeing.—The sense cells of the eye are the rods and cones of the *retina*. These are highly sensitive

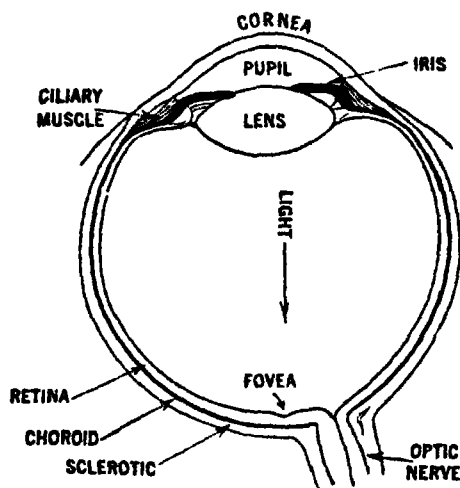


FIG. 4

Horizontal cross-section of the left eyeball.

to light and, upon stimulation, start a current over the optic nerve to the brain.

All other parts of the eye are accessory to the retina. The eyeball has an outer tough coat called the *sclerotic*, lined with a deeply pigmented *choroid* coat which prevents stray light

from blurring the vision. At the front of the eye the sclerotic coat becomes the *cornea*, where light is admitted, and the choroid coat becomes the *iris*, which not only gives distinctive color to the eye but is provided with muscle fibers for narrowing and widening the pupil, thus limiting the admission of light when illumination is strong. The *pupil* is the hole in the center of the iris.

Directly behind the pupil is the *lens*, made adjustable by the functioning of the *ciliary muscle* and convex on both surfaces (more so behind than in front). The lens separates the interior of the eye into two cavities—a small one between it and the cornea and a larger one between it and the retina. The small cavity, just in front of the lens, is filled with *aqueous humor*, and the larger cavity, behind the lens, is filled with *vitreous humor*. The humors keep the eyeball in shape but are transparent and allow light to pass through to the retina.

The cornea also acts as a lens but is not adjustable. Through its functioning with the (crystalline) lens proper, a picture is made upon the retina. The picture is upside down, a fact of which we are never conscious in looking at objects; actual visual sensations take place in the brain and their projection to the exterior is a secondary act that has been learned from experience.

The retina itself is a thin coat at the back of the eyeball and lies inside the choroid. It has the form of a hollow hemisphere, and light strikes it from inside the eyeball. The optic nerve does not leave the center of the retina but at a point some distance toward the nose. At the center of the retina is the *fovea*, the "central spot," which has the best visual capacity.

Visual Sensation. —Light waves, or vibrations, succeed

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each other at a rate of approximately five hundred trillions per second, with a speed through space of 186,000 miles per second. When they act upon the sensitive parts (rods and cones) of the eye, visual sensations, i.e., brain responses, result.

All visual sensations are characterized by degrees of brightness and degrees of color. Although, from the standpoint of physics, white light is a mixture of all wave lengths and black is the absence of light (the various shades of gray, or mixtures of black and white, being bright but not possessing color), we get sensations from each. And, although there are but four primary colors (red, green, yellow, and blue), all other being produced by appropriate mixture of two or more of these, there are about thirty thousand different color sensations.

The eye easily becomes adapted to both brightness and color. *Dark adaptation* is illustrated in the adjustment of the eye when a room is suddenly darkened. At first, nothing at all can be seen, but gradually one is able to see the shape of large objects and after 20 or 30 minutes small details can be made out. *Light adaptation* occurs when the lights are suddenly turned on again. The glare is blinding at first, but the eye soon adjusts and vision becomes normal. *Color adaptation* is exemplified in the use of colored glasses. When they are first put on to protect the eyes from the glare of the sun on sand, snow, or alkali, one is conscious of change of color in the landscape but this effect soon disappears.

When a visual stimulus is suddenly removed there is an *after-sensation* for a momentary time. A positive after-sensation may be produced by looking directly into the sun on a clear day; when you look away you still see the brightness for a short time although the stimulus is no longer there. The after-sensation is due to inertia of the retina. The

activity of the retina continues after the stimulus has been removed. The positive after-sensation may be followed by a negative after-sensation, in which the brightness or color relations are just reversed. This can be seen by directing the gaze to a square of red paper for twenty seconds, then turning to look at a gray paper. A green square will appear on the gray paper; red's complementary color has succeeded it.

When the normal eye is directed at anything near at hand, the lens has a pronounced curvature of the front surface. The normal eye forms clear images of distant objects without effort, and accommodation is made for near vision.

There is a limit to this accommodation, however, and each person discovers for himself the shortest distance at which he can distinguish certain types of details. As he grows older the accommodation is made less easily, until, in advanced age, a condition called *presbyopia* (loss of accommodation) is common. To offset a weakening of this power we substitute convex glasses for fine work, thus adding to the total refracting power of the optic system.

It should be noted in passing that each of us has a blind spot in his vision. This can be tested by looking steadily with the left eye at an object straight in front and, starting at the point of gaze, move a small coin at arm's length slowly to the left. The coin will disappear at about twenty to thirty degrees out.

Visual Defects in Children.—In considering visual sensation in education we are concerned most with visual defects found among children in the classroom. A child has perfect eyesight if, when the eye is at rest, parallel rays of light are focused directly upon the retina. Not many children, however, have perfect eyesight. Roughly, about 2 per cent of school children have perfect vision, about 62 per cent have

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normal vision (no serious defects), while at least 12 per cent have serious defects.

The commonest defects are due to the shape of the eyeball; either the lens, or the cornea, when not perfect, causes errors in refraction and therefore an improper retinal image.

Short-sightedness, or *myopia*, is usually due to too long an eyeball. When an object is too far away, the rays of light are focused in front of the retina and cause a blurred image. While, under this condition, there is seldom any eye strain, the strain on the muscles of the forehead and the eyelids often causes headaches. Scientists distinguish two kinds of myopia—functional and pathological. Functional myopia, produced by an hereditary long eyeball and probably by an excessive amount of near work, usually appears in late childhood or early adolescence and becomes arrested before the age of twenty-five. Pathological myopia is a diseased condition of the eye which tends to increase and eventually lead to blindness.

Far-sightedness, or *hypermetropia*, is usually due to too short an eyeball. When the object is too close, the rays of light are intercepted too soon and the image can not be brought into focus. The strain in attempting to bring the object into focus is severe and results in headaches, twitching pains in the eyeball, or inflammation of the eyes. The infant is far-sighted from birth, but, as he grows older, normal vision develops and, by the age of twenty, if he is still pronouncedly far-sighted, he is one of the 4 per cent of persons so afflicted.

Astigmatism is due to error of refraction caused by irregular curvature of the cornea or sometimes the lens. Common to both short-sightedness and far-sightedness, and sometimes resulting from combination of the two, it is not only responsible for most cases of eye strain and for more

than half of the headaches children experience but for more than half of the cases of seriously impaired vision as well. Very few eyes are entirely free from astigmatism, for in most some parts of the field of vision are blurred while others are distinct.

"*Cross-eye*" may be due to congenital and excessive hypermetropia of one of the eyes. It is a muscular disturbance that early produces strain and causes the child to avoid the use of one eye, with the result that before long it can not be focused. About 2 per cent of school children are so afflicted.

Testing for Visual Defects.—While teachers are not prepared to correct visual defects, authorities are agreed that they and school nurses should carry on systematic tests of vision. Each school should be supplied with a standard eye-chart, such as the Allport, the McCallie, the Lowell, or the Snellen.

The Snellen charts, one for children who can read and one for illiterates, have been widely used and are familiar to most persons. The letters on the charts vary in size from those which can be read by the normal eye at a distance of 15 feet to those which can be read by the normal eye at a distance of 200 feet, the 20-foot line being the standard. Full directions for use are given with the charts.

Necessary Precautions.—The child's eye is gradually developing and the course of a defect should be followed from year to year. If glasses are worn it is probable that they should be changed occasionally.

Some of the outward signs of eye strain are: frowning, sensitiveness to light, headache, nervousness, poor spelling, and poor reading. The teacher should watch for signs of strain and, when they appear, *see that the child is seated*

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where he will be able to see best and with the minimum amount of strain. Attention should also be given to proper lighting of the classroom, to size of letters in both handwriting and textbooks, and to occasional rest periods. In all cases of serious visual defect the parents should be informed.

Color-Blindness.—Every one is color-blind to some degree. The outermost zone of the retina is almost totally color-blind and an intermediate zone is red-green blind. In total color-blindness only white, black, and various shades of gray appear, while, in red-green blindness, white, black, and gray are supplemented by blue and yellow.

Total color-blindness of the complete eye is rare, but, among school children, red-green blindness appears in from 3 to 4 per cent of the boys and in three-tenths of one per cent of the girls.

Testing for Color-Blindness.—In such school subjects as sewing, drawing, and nature study pupils who are color-blind work at great disadvantage, and it is necessary to know who these are. Not only must they receive special guidance in those subjects but must later be directed away from occupations in which their peculiarity of vision may endanger lives, such as in railroading and navigation, or may make their services seriously inconvenient, such as in the sale of colored ribbons and goods of various sorts.

To test for color-blindness the teacher may use either the Nagel Card Test, composed of two divisions, one employing sixteen spotted cards and another four cards with plain colors, or the Holmgren Wool Test in which colored skeins of wool are used.

Each child should be tested for color differences at least

once and definite cases of color-blindness should be reported to the parents.

Eye-Learning.—Some children tend toward eye-learning, i.e., they learn more easily through the sense of sight than through the sense of hearing, although this may not be true in each subject studied. Studies of eye-learning have led to greater emphasis upon visual education—the use of maps, pictures, charts, diagrams, exhibits, and projection instruments. These visual aids are important, but they are effective only when the subject-matter demands their use and when they are in line with the child's previous experience.

Equipment for Hearing.—The ear has three divisions: the outer, the middle, and the inner. The outer ear comprises the *pinna* (the exposed part of the ear) and the *auditory canal*, along which vibrations of sound pass inward to the *tympanic membrane* (ear drum). The auditory canal contains glands which secrete wax for protection of the drum.

The middle ear, or *tympanum*, is separated from the outer ear by the tympanic membrane, and consists of a small cavity lying in the temporal bone of the skull and connected with the throat and pharynx by the *Eustachian tube*. Across the tympanum, from the ear drum to the *cochlea*, is a chain of three small bones, the ear *ossicles* (hammer, anvil, and stirrup).

The inner ear consists of a *membranous labyrinth* lying within a *bony labyrinth*. The former is lined with very sensitive cells which connect with nerve fibers leading to the brain, i.e., the auditory nerve. Each cell has a number of fine hair-tips which are shaken by sound vibrations coming through the liquid of the inner ear.

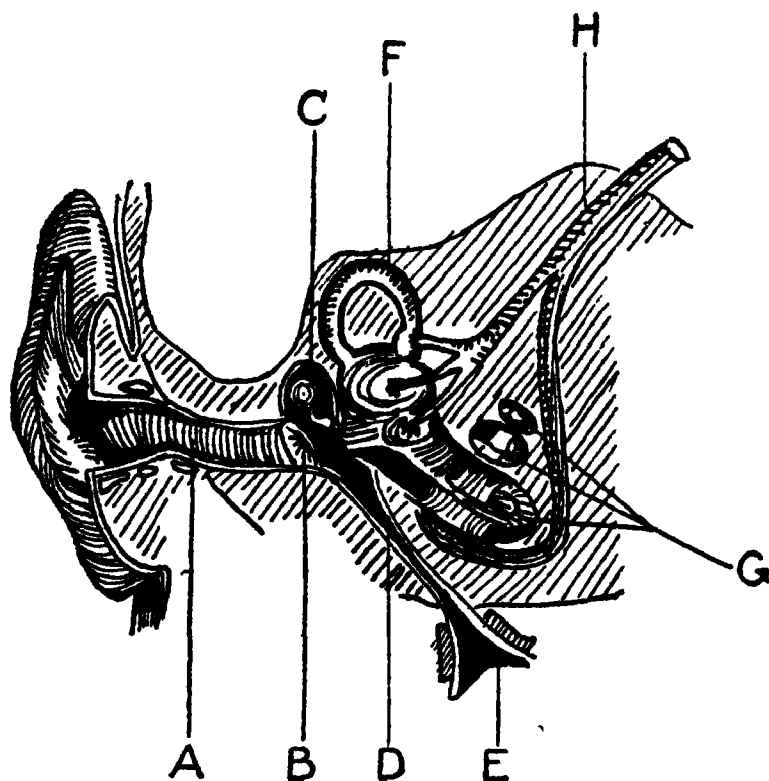


FIG. 5

Diagram of the ear (after *Hough and Sedgwick*). *A*, the auditory canal; *B*, the tympanic membrane, or ear drum; *C*, tympanum; *D*, Eustachian tube; *E*, pharynx; *F*, semi-circular canals; *G*, cochlea; *H*, auditory nerve.

Auditory Sensation.—The sensation of sound is produced by longitudinal (to and fro) vibrations which reach the inner ear. Usually these vibrations are carried from the sounding body to the ear drum by means of air waves. The vibration of the ear drum is taken up by the middle ear and transmitted along the ossicles to the cochlea in the inner ear where a nerve current, over the auditory nerve, is sent to the brain.

Sound vibrations travel at a rate of 1,100 feet per second, but they vary in wave-length (vibration rate), in amplitude (energy), and in complexity (mixture of different wave-lengths). These variations respectively determine the pitch, strength, and quality of sound. Waves to which the ear is most sensitive have between 500 and 5,000 vibrations per second, the lower limit of audibility being about 20 vibrations per second, the higher about 20,000 vibrations per second.

It should be mentioned in passing that the air in the tympanum is under the same pressure as that of the atmosphere outside. Consequently there is no undue bulging of the ear drum. On the other hand, when there is extra pressure on the ear drum from the tympanum, relief is ordinarily secured through swallowing. Swallowing opens the end of the Eustachian tube which leads into the pharynx, thereby lowering the pressure.

Again, attention should be called to the fact that the inner ear contains the semi-circular canals, which have nothing to do with auditory sensation but with rotary movements of the head and help us maintain balance and establish direction.

Auditory Defects in Children.—While not so common as defective eyesight, defective hearing in school children is more widespread than is generally supposed. From 10 to 20 per cent of the children of any unselected group do not

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hear normally and from 2 to 3 per cent suffer from serious defects.

In some children, due to loss of functioning power of certain segments of the bony structure of the ear, there are *tonal gaps*, and, when the range of hearing is reduced at either or both ends to a remnant as small as two octaves, the remnant is known as a *tonal island*. Loss of hearing, therefore, if the inner ear is injured, may occur at any pitch level.

Deafness is both congenital and acquired, about half the cases of this defect being due to: (1) diseased conditions of the nose and throat; (2) infectious diseases; and (3) stoppage of the outer canal. More than half of the acquired cases of deafness result from neglected colds, adenoids, and chronic catarrhal conditions, while the chief infectious diseases responsible for deafness are measles, scarlet fever, and diphtheria.

The common indication of ear trouble is the discharging ear. This condition results when disease of the mucous membrane of the middle ear prevents drainage to the pharynx and the atmospheric pressure on both sides of the ear drum causes a rupture. Other indications are: a "what" to every question, chronic inattention, stupid appearance, expressionless voice, complaint of earache, and difficult nasal breathing.

Testing for Auditory Defects.—One of the best tests for auditory acuity is the Seashore audiometer which permits testing at the ear by means of telephone receivers and also permits varying of the intensity of sound. Because of the expense not all schools can be supplied with the audiometer and the teacher must resort to simpler and less reliable tests.

Among the tests to be used are the watch test and the whispered speech test. The ordinary watch has a normal range of 3.5 yards, and a child who cannot hear its ticking

more than a yard away is to be considered deficient in hearing. The whispered speech test consists of pronouncing in a whisper a series of words or digits which the child repeats if he hears them, either saying them aloud or writing them.

The measure for average acuity in these tests is the average for the group of children tested.

Necessary Precautions.—Children returning to school after attacks of scarlet fever, measles, or diphtheria should be watched for impairment of hearing and, *in cases of the discharging ear, care should be taken that infection is not spread to other children. Parents should be informed of the condition and of any indication of poor acuity.* Often a child's hearing may be saved if action is taken soon enough.

Children who do not hear well should be seated where they may hear best, and it should be remembered that some hear best at certain pitch levels.

Ear-Learning.—Some children tend to learn better through the sense of hearing than through the sense of sight, although this may be true only in single subjects. Such children, as a result of imitation, habit, or training, do not so fully comprehend the words on the printed page as those which are pronounced to them orally. Consequently visual aids are sometimes ineffective and the teacher must take special pains to explain the subject-matter under discussion.

Equipment for Tasting.—The sense organs of taste are taste buds on the tongue and the soft palate. These taste buds are oval and each consists, externally, of a number of flat cells and, internally, of seven or eight taste cells. Twined about the base of each taste cell is a sensory neurone which carries nerve currents over the nerve of taste to the brain stem and thence to the cortex.

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The tongue and soft palate are accessory apparatus to the sense of taste, bringing substance to the taste cells.

Gustatory Sensation.—When food is taken into the mouth it is reduced both mechanically and chemically. The

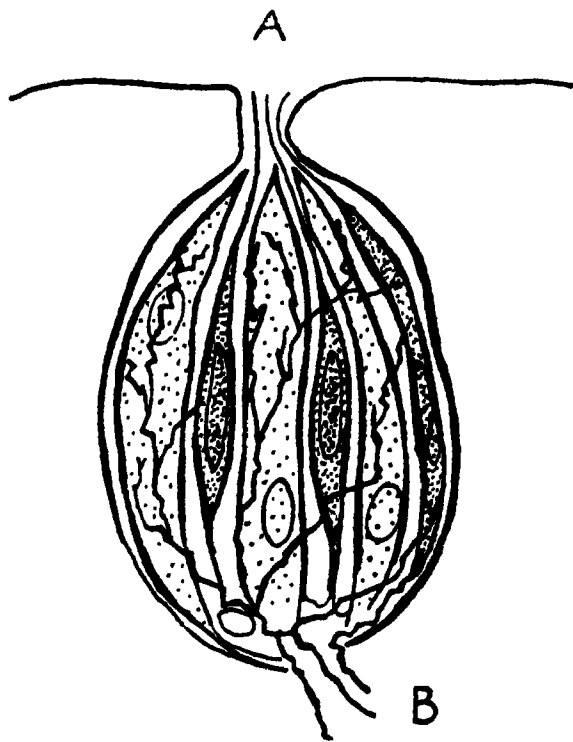


FIG. 6

Diagram of a taste bud *A*, taste pore; *B*, nerve fiber entering taste bud.

action of the teeth and tongue carries it to a large number of taste buds, while saliva, acting as a solvent, not only brings it to a fluid state but carries it to still other taste buds in the hidden crevices.

Anything to be tasted must come either in liquid form or in substances which may be dissolved in the mouth. Experiments have been carried on to determine the number of separate tastes. For example, fluids are warmed to body temperature; the nose is tightly plugged up; and the fluids are applied with a small camel's-hair brush. Care is taken that the fluids are weak enough to avoid causing reflex tongue movement and that there be no spread of stimulus from one set of taste buds to another.

As a result of such experiments it is generally agreed that there are but four tastes and that sensitivity to the four is greatest in areas indicated:

Sweet at the tip of the tongue.

Bitter at the base of the tongue.

Acid, or sour, along the lateral edges.

Saline, or salt, at the tip and along the edges.

In compounding certain solvent substances, taste sensations may be fused. Weak solutions of sweet and salt will yield an alkaline taste, while the sensation of sweet may be neutralized by adding a few grains of sodium chloride. Adding sugar to lemon juice diminishes acidity, so that there is a taste fusion. While sugar and starches are chemically allied, the latter do not yield a sweet taste. Incidentally, tastes are often evoked by substances contained in the blood; a jaundiced person experiences a bitter taste, while the diabetic often experiences a sweet taste.

All seeming tastes, other than the four and their compounds, are but odors. One may drink strong coffee with relish because of its pleasant odor; with the nostrils tightly closed, it has a taste similar to quinine (bitter). Likewise, with the nostrils closed, onion juice and apple juice can not be distinguished from each other.

It is difficult to eat some foods because of their odors,

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although the tastes may be pleasant. However, the taste buds tend to adapt themselves to unpleasant liquids, so that, for example, a child may be taught to eat soft-boiled eggs or to take cod liver oil.

Sense of Taste in Education.—School lunches, parties, and courses in cooking bring the sense of taste into play. The innate tastes of the child will remain the same but their uses may be improved. For example, a child often will refuse to eat anything salty after he has eaten something sweet, and a reversal of this procedure will cause him to use the sense of taste with profit. We may recommend here that the teacher *attempt to develop right mental attitudes toward wholesome foods and introduce new food combinations which will create appetite for foods shunned when served separately.*

Equipment for Smelling.—The sense organs of smell occupy a very small area at the top of the nasal cavity and it is over this area that the olfactory nerves are spread. The olfactory cell is bipolar (runs out into a process at each end) and lies in the membrane of the nasal cavity. Between the olfactory cells are non-nervous supporting cells, and along the periphery of each cell is a number of hairlets which project into and slightly beyond the membrane. The other end of the cell makes contact with the olfactory nerve which leads through sponge-like bone to end in cells situated in the olfactory bulb in the base of the brain.

Olfactory Sensation.—The olfactory cells, lying as they do directly above the air passages, are stimulated by material coming in contact with them. So far as is known the odor-producing material must come in the form of a gas which produces its own odor, or, if odorless, must carry

particles of other materials which produce the sensation of smell.

There are many different types of odors, but, due to the fact that the sense of smell has played such a small part in determining human behavior and to the further fact that the olfactory cells lie in such a secluded position, these odors have not been completely and definitely classified. From Henning's classification we get the following six elementary odors:

Spicy (in pepper, cloves, and nutmeg).

Flowery (in heliotrope).

Fruity (in apple, orange oil, and vinegar).

Resinous (in turpentine and pine needles).

Foul (in hydrogen sulphide).

Scorched (in tarry substances).

Difficulty in classification comes in the compounding of certain odors. Resinous and scorched both are detected in roasted coffee, and fruity and spicy are experienced in peppermint.

We easily adapt ourselves to both pleasant and unpleasant odors. Students of chemistry and anatomy "get used to" their respective atmospheres; and men who work in sugar and phosphate factories require but a short time to get accustomed to the odors characteristic of such plants. Likewise, constant contact with greenhouse flowers weakens the sensitivity to their odors.

Many odors, or their compounds, are obnoxious when first experienced, and this has resulted in artificial compounding of certain odors for cancellation of stimuli. Perfumed chemicals are now being used as sterilizers and disinfectants; soaps, rubbers, and silks are being treated for objectionable odors; paper is soon to lose its odor of casein; and paint will no longer "smell" of linseed oil and turpentine.

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From studies made of the subject it has been found that the following odors are preferable to men and women respectively:

<u>To Men</u>	<u>To Women</u>
Pine	Rose
Lilac	Lilac
Rose	Balsam
Violet	Coffee
Coffee	Strawberry
Cedar	Raspberrv

Likewise, the following odors are extremely objectionable:

<u>To Men</u>	<u>To Women</u>
Olive Oil	Kerosene
Kerosene	Olive Oil
Rubber	Rubber
Lard	Lard
Garlic	Garlic
Perspiration	Perspiration

In general it is shown that men prefer spicy odors and women prefer the heavy flower scents. The two most objectionable odors, as weighed by expression of preference, are garlic and perspiration.

Sense of Smell in Education.—Out of every ten school children there are two or three who have a very poorly developed sense of smell and two or three who are strongly influenced by smell—sometimes more than by sight or touch.

The sense of smell has its incidental uses with paints, flowers, cooking foods, and obnoxious odors and is to be used

educationally in two ways. *Use the sense of smell for training in identification of plants and chemicals and improve its use through lessons in appreciation of things enhanced by their odors.*

Equipment for Touching.—The human skin has an area about as large as a rug 3 feet wide and 6 feet long, and its whole surface, including the lips, the mucous membrane of the mouth, the cornea of the eye, etc., is subject to cutaneous stimulation.

All normal points on this great expanse are connected with nerve terminals which represent the splitting up of the nerve fiber when it enters the epidermis and which lead in from small sections. These terminals, or axons, sometimes enter the cells of the skin, but they usually lie in between the cells and around the roots of the hairs in the skin.

Cutaneous Sensation.—At least four kinds of sensation may be included in the sense of touch—cold, warmth, pressure, and surface pain. The fact that several kinds are possible is accounted for by the theory that a corresponding number of inleading pathways exist, over which are conducted the nerve currents which give rise to the sensations of touch.

1. *The cold sense.* To test the presence of cold spots on the skin, mark off a small, well-defined area and, with a blunt metal or pencil point, dipped in cold water, pass over the area slowly. At most points only the sensation of contact arises, but at others there is a definite sensation of cold. When the cold spots are found and marked they will continue to give the same sensation.

2. *The warmth sense.* Warmth spots may be found in the same way. This time heat the blunt metal or dip the pencil

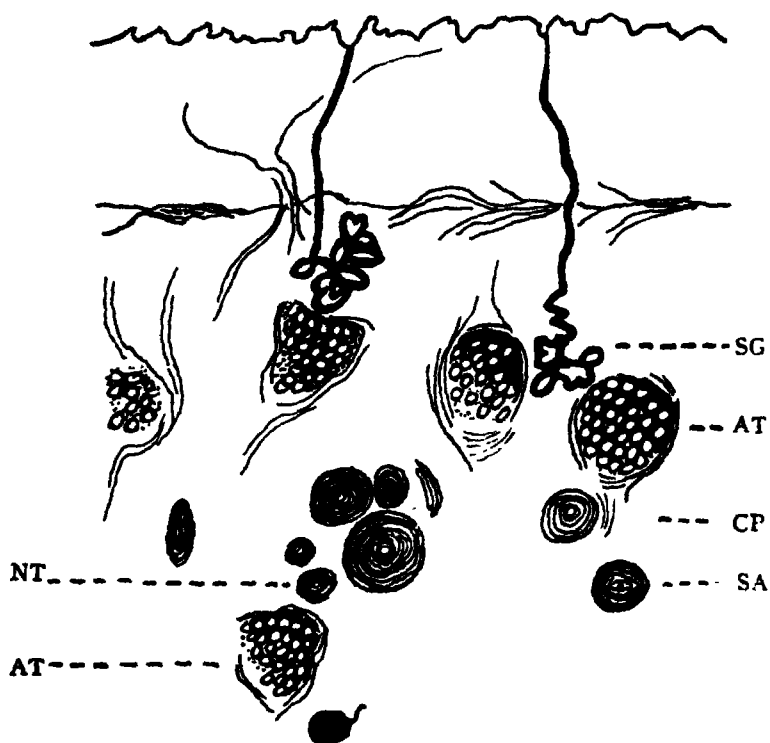


FIG. 7

Cross section of skin, with epidermis or outer layer removed. *SA*, small artery, *CP*, corpuscle; *AT*, adipose (fatty) tissue; *NT*, small nerve trunks, *SG*, sweat glands.

point in hot water and pass over the skin. There will be points at which a definite sensation of warmth will be felt. They, too, continue to give the same sensation when stimulated.

The presence of these spots differs greatly in different parts of the body and, on the average, there are about 13 cold spots to 2 warm spots.

3. *The pressure sense.* Practically every part of the skin is supplied with pressure spots, the average per square inch being about 25, with a range of 7 to 300. To test their presence, mark off a small area and stimulate it with hairs, bristles, or finely spun glass of varying length and thickness. Spots will appear at which reactions may be secured. It is better to use a non-hairy area, but if a hairy area, such as the back of the forearm, is shaved and the position of the hairs marked, a pressure spot may be found on the windward side of each hair entrance.

The parts of the skin which contain the largest number of pressure spots are the tip of the tongue, the finger tips, and the red portion of the lips. The blind, as everybody knows, learn to substitute the pressure spots of the finger tips for the sense of sight in reading. Outstanding examples of this extraordinary power of substitution are: the blind telephone operator at Erie, Illinois, who uses the Braille system in making connections; and the quarry worker at Fort Collins, Colorado, who, having lost his sight and his hands as the result of an explosion, learned to read the Bible by touching his tongue to raised letters.

4. *The pain sense.* Pain reactions may be aroused by mechanical, thermal, electrical, and chemical stimulation if the tissue is pricked, cut, burned, or torn. To test the presence of pain spots, moisten thoroughly a very small skin area and go over it with a finely-ground needle-point. Usually pain

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spots do not coincide with the other cutaneous spots mentioned, yet they are far more numerous than any of the others.

In testing for pain spots one gets quite regularly simply the sensation of contact. This is because sensitivity to pressure is a thousand times greater than that to pain. The cornea has many pain spots while the back of the mouth and the back of the tongue have very few.

Sense of Touch in Education.—The sense of touch is drawn upon in texture discrimination. Sensitivity to texture differences is dependent upon the toughness of the skin and the uses to which it has been put. Here again the teacher should *improve the use of the sense by teaching the children to identify substances by their "feel."* Due to a more delicate skin girls are more easily trained in this than boys and easily learn to give value to material according to its coarseness or fineness.

Equipment for Organic Sensation.—In general, the thoracic, abdominal, and pelvic cavities comprise the area which gives rise to organic sensations. The smooth muscles of this area are supplied with sensory nerves connecting with the spinal cord and brain, and these nerves either have free endings or terminate in corpuscles.

Organic Sensation.—While many of the pain endings in the internal structures are never called upon to function, sensory endings frequently stimulated are those which lie in the diaphragm, the heart, the stomach, the alimentary canal, the soft palate, and those connected with sex and elimination.

Sensitivity to pain is lacking in the heart, arteries and veins, spleen, pancreas, kidneys, and lymphatic glands, but

sensations arise when there is hunger, thirst, nausea, neuralgia, and suffocation. Hunger pains, for example, result from contractions of the empty stomach, which stimulate the nerves distributed to the mucous membrane, and thirst sensation comes from dryness of the soft palate.

Because organic sensations are so frequently fused with other sensations, they are not only difficult to trace but difficult to describe. One says, in a general way, that he is hungry or has a stomach pain, but there is such poor integration between organic sensory-motor processes and speech functions that the hunger or pain can not be definitely localized.

Organic Sensations in Education.—In considering the organic sensations the teacher need but *remember that excessive hunger, thirst, nausea, and kindred sensations often interfere with learning and that they are to be dissipated before satisfaction can be gained from learning processes.*

Equipment for Kinaesthetic Sensation.—While the muscles, tendons, and surface joints are motor mechanisms they serve as sense organs as well. Imbedded in them are sensory endings which are stimulated by movements of these motor organs.

Kinaesthetic Sensation.—Because these sensory endings are so deeply imbedded it is impossible to stimulate them without stimulating the organs of touch lying above them. They do get stimulation, however, from movements of the tissues themselves in normal muscular contraction, for, when a muscle is contracted, it causes the structures in the tendons and joint surfaces to react. In fact whenever an explicit bodily movement is made, such as walking, talking, drinking, or eating, these associative reactions result.

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Through kinaesthetic sensation we are not only made aware of soreness in the muscles and stiffness in the joints but are informed as to the positions of the legs and arms and are able to move these at will. Further, we are made at least partly independent of the higher senses. Because of kinaesthetic sensations the child learns to walk without considering each step, and the stenographer or pianist learns to type or play without looking at the keys.

In maintaining balance and establishing direction, we are aided by the semi-circular canals. These, we said, are located in the inner ear. They contain a fluid called *endolymph* and hair cells which are affected by pressure due to movements of the head.

When the canals are stimulated every muscle of the body is likely to be affected. The first noticeable effect is an involuntary oscillation of the eyeballs called *nystagmus*. This may be followed, if the stimulation is violent, by vomiting. Sea-sickness, a universal preventive for which has not yet been found, is accounted for by disturbance of the semi-circular canals *plus* visual, mental, and olfactory impressions. Train sickness, airplane sickness, and swing sickness are accounted for in the same manner, as is dizziness resulting from being revolved rapidly. While there may or may not be adaptation to changes in rectilinear motion (one may get over sea-sickness before the motion stops), adjustment soon follows when the motion ceases.

Muscular Handicaps.—Compared with those of the adult, the child's muscles are less accurate, have less strength, and are less delicate in coördination movements. Also they contain a greater proportion of water and their weight, in relation to the weight of the entire body, is much less.

Kinaesthetic Sensations in Education.— These handicaps, together with the fact that control of the fundamental muscles, comes much earlier than that of the accessory muscles, makes it imperative to *omit from the pre-school and the kindergarten all training demanding delicate coördinations and subordinate such training in the lower grades, else extreme nervousness will result.*

When the eye muscles, for example, are used to excess for fine work there is a lack of balance, and the same is true of the hand muscles since proper exercise of the larger muscles of the arms, legs, and trunk is neglected. This means that *motor learning, drawing, manual skill, writing, play instruction, and kindred activities are to be offered in such ways and at such times that the muscles will develop naturally and without over-strain.*

HOW PERCEPTIONS ARISE

So far we have been speaking of sensation as if it were "pure," i.e., as if it were complete in itself as a mechanical process. It is not complete until it is given a meaning, and we said that the meaning we give to sensation is called *perception*.

Examples of Perception.—A child holds a pencil in his hand. It has color and form, but it is more than color and form; it is something with which to write. It has meaning. He *perceives* it as a pencil.

Again, he hears the sound of a bell. He perceives it as the warning bell for classes to begin. The sensation which arises from the sound is not complete until he gives it meaning. If he stops his play to take up his class work he has reacted to the sound of the bell. That is his response.

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Differences in Meaning.—A thing has meaning to us in the sense that we react to it in some way; it influences our behavior. In the complete description of sensation, therefore, we have the order stimulus-perception-response, in terms of conscious behavior; or sometimes stimulus-response-perception, in terms of instinctive and habitual behavior—the response taking place before meaning can be given to a sensation.

That which has a certain meaning to one person, however, may have a very different meaning to another. This is determined by their past experience. It is possible that they may come to an agreement in their interpretation, but, in doing this, they will have taken different courses, have been appealed to in different ways.

Perception and Apperception.—This difference in interpretation is responsible for the doctrine of apperception—the theory that we give present experience meaning in terms of past experience, where the experiences are similar. We learn to detect likenesses and differences in things or situations.

A difference between perception and apperception is made in this way. In perception we have an object presented to the senses, but, in apperception, we identify the object or those features of it which were familiar to us before; we recognize it, explain it, or interpret the new in the light of our previous knowledge.

The difference, then, is simply one of amplifying the process through which we attach meaning to experience.

Perceptual Training.—In building percepts the teacher should keep in mind three facts previously stressed:

1. All learning comes through the senses.
2. Keeness of the senses is inherent; their use only, not the senses themselves, may be improved.
3. No sensation is complete without perception.

It is the teacher's task to guide the child in his learning, and a chief activity is to arouse sensations which will lead to proper perceptions. That is not easy, due to the past experience of children, because of which they differ greatly in the meanings they are likely to give, and due to conditioning factors set up by sensory defects.

Methods for Building Percepts.—In teaching the child to give meanings to his sensations one of two general methods is used: (1) the demonstration method, in which he gets direct experience with real things, qualities, events, and relations; or (2) the project method, in which he lives the experience and works out his own meaning. Each of these has its advantages but each is marked with some measure of artificiality.

The Demonstration Method.—An example of the demonstration method is as follows. The teacher points to an object on her desk—a bowl. She picks it up, strikes it gently with a pencil, turns it around slowly to exhibit its shape and design. She passes it among the pupils in order that they may not only see it at close range but may feel its texture. The teacher then explains how it is made from mud, that it is relatively fragile, and that it is used for holding flowers. She is building percepts, or giving meanings to sensations.

In this example the teacher is showing a product. She might also, in the use of this method, demonstrate an act of skill, such as handwriting, or show the operation of apparatus by means of objects or models.

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The Project Method.—In using the project method the teacher brings a supply of pottery clay to the classroom. Each child is given some. Using the finished bowl as a model, the children are taught to mold bowls with their hands. They use sight and touch and learn how bowls are made by making them.

The Two Methods Combined.—The two methods are best used in combination. Here the teacher first talks about bowls. She makes sure that the children know what they are, referring to their past experience—have they seen them at home?

Picking up the bowl on her desk, she raps it gently, and explains its details and uses. Using it as a model, she requires the children to reproduce its form by cutting it from paper, then by drawing it with pencil or crayon.

She tells them about the mud banks where clay for bowl-making may be secured. They know about these; they have played there. She takes the group to the mud banks and sees that each child secures a supply of clay. Returning to school they spend some time making pottery. The best designs are rewarded. They may even be sold.

Through such procedure the children learn by seeing, hearing, touching, and above all by doing. In like manner, in plant culture they are caused to use the senses of smell and taste.

Use of Apperception.—As the children follow through these methods they begin to form abstract ideas. Memory is called upon to bring back past experience, and the new is given meaning in terms of the old. The child learns to detect likenesses in things or situations. He also learns to create, and a good beginning has been made.

Growth of Perception.—Changes come about in the child's perception through analysis. At first he sees qualities as inherent in objects or situations. The color *red*, for instance, may be identified with his red sweater and nothing else. Later he sees it on the binding of a book, on a house, or on a fire engine, and begins to think of red as a color quality.

Changes come about also through synthesis. At first he thinks of *riding* as something one does for pleasure—on a bicycle, in an automobile, in a train. Later he sees riding as transportation—a perception which involves not only bicycles, motor cars, and trains but also horses, wagons, motorcycles, street cars, ships, and airplanes. A bicycle he classifies as a means for transportation, a convenient means for getting somewhere without walking.

Special Kinds of Perception.—There are special kinds of perception which develop very slowly. The average child is six years of age before he can distinguish between morning and afternoon. His perception of *time* is very vague, and time intervals finally become identified through habitual events—meals, sleep, school, Sunday school, regular holidays—or sometimes through outstanding events such as birthdays or excursions.

Perception of *number* is the result of gradual growth. Children of six years of age have completely accurate concepts of one and two, serviceable concepts of three, very serviceable concepts of four, but vague concepts of the numbers five to ten. They find it more difficult to count objects than to count without objects.

Although very young children perceive differences in *color*, their color preferences are not strong. Experiments (see references) have shown that perception of color depends

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largely upon association with objects from which the child has experienced pleasant or unpleasant reactions.

Perceptions of *space*, *rhythm*, and *weight* develop through a long process of trial-and-success. Distance, size, form, and direction are concepts that not only must wait on the developing eye but must come from repeated experience. They are subject to illusion. Rhythm is partly dependent upon the physiological condition of the ear and partly upon muscular balance and coördination, while weight perception is seldom accurate even in the adult.

Illusions.—Illusion is best described as false perception. Everybody is subject to false perceptions, so that illusion is a common and normal experience.

Many persons have experienced the illusion which arises when, in driving directly toward the lowering sun over an oiled road, the road, at some distance ahead, has the appearance of being wet.

Others have experienced the mirages of the desert where clumps of trees or hillsides seem to rise for a time out of the wastes of sand, sagebrush, and cactus.

On clear days, mountains which in reality are many miles away appear to the unpracticed as close at hand; and, on hazy days, objects indistinct in outline may seem to be much farther removed than they really are.

We are therefore subject to illusions in space perception.

Moreover each of us is influenced by his state of preparedness; what we expect to see may seem to be actually present. A group of men surrounding a jail may not exceed, in actual numbers, fifteen or twenty, but we see it as much larger, due to the accompanying excitement which acts as a preparative agent. For the same reason we tend to exaggerate the number of shots we hear fired.

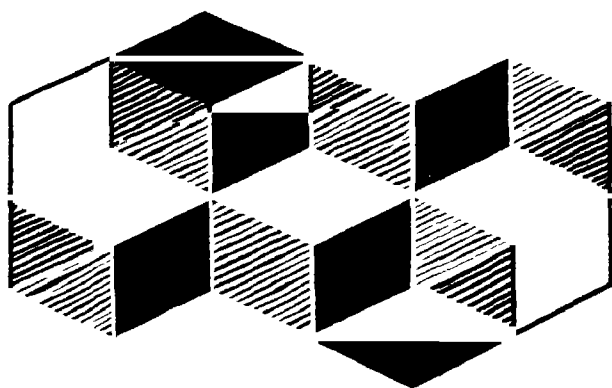


FIG. 8

Reversible perspective. On gazing fixedly the image will change from two blocks with black tops resting on three others with black tops, to one of three blocks with black bottoms resting on two blocks with black bottoms. Still other figures may appear. Experiment by turning the book half way round.

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Hallucinations.—A state of preparedness sometimes leads to an abnormal state of consciousness known as hallucination. The hallucination is a subject sense-image and results from one or more of four causes: (1) a high degree of suggestibility; (2) hypnotism; (3) functional sickness; and (4) insanity.

A superstitious child, influenced by folklore and tradition to believe in ghosts, is sure to see them in places where they are supposed to dwell. This is an abnormal state arising from false perception.

Hallucinations may be elementary, such as when one sees pillars of fire; or complex, in which words are heard and forms seen. Perpetuated, hallucination may become the cause for mental disease.

As for hypnotism, there is a common belief that only the weak-minded can be hypnotized. Judd denies this. He states that the only persons who cannot be hypnotized are young children, idiots, and insane persons; these cannot concentrate their attention, a power absolutely essential if one is to be hypnotized.

Task Is to Destroy Illusions.—The great task in building right percepts is that of producing the same meaning in the minds of all the children of a group, of suggesting each, for the time being, into the same channels of thought. This is not an easy thing to do but the teacher can *improve the use of the senses by building new percepts based upon others drawn from the child's experience—fruits, flowers, and domestic animals*. Then she may combine the demonstration and project methods to show relationships: (1) *between known elements not previously connected*; and (2) *between known and unknown elements*.

Child Governed by Perception.—The child's reactions are in line with the meanings he gives to his sensations, i.e., in line with his previous experience. If they are to be correct his perceptions must also be correct. Most of our disagreements are due to disparity in interpretation, which means that either we have been trained in different ways or our training has at times been superficial. Training in commonly accepted and exact meanings cannot be too thorough nor the process be begun too early.

QUESTIONS AND PROBLEMS

1. Define sensation and perception and show the inevitable relationship between the two.
2. In your own words describe the composition of the eye.
3. Give an original example of visual sensation by tracing it from stimulus to response.
4. Name and illustrate three kinds of eye adaptation.
5. Give an original example of after-sensation.
6. What are the causes for *myopia* and *hypermetropia*?
7. What is *astigmatism* and what are the indications of its presence?
8. How should the teacher test for visual defects?
9. What are the signs of eye strain and what can the teacher do to reduce it?
10. What is color-blindness and how would you test for it?
11. In your own words describe the composition of the ear.
12. Give an example of auditory sensation by tracing it from stimulus to response.
13. What is meant by tonal gaps and tonal islands in auditory acuity?
14. What is the common indication of ear trouble and what causes it?
15. Give two tests for deafness which the teacher may use.
16. What is the significance of eye-learning and ear-learning in the teaching process?

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17. Show, by describing the sense organs of taste, why we are able to distinguish between tastes. How many tastes have we and what are they?

18. What part does the sense of taste play in directed education?

19. Give an example of olfactory sensation by tracing it from stimulus to response.

20. What are the six elementary odors identified by Henning?

21. What part does the sense of smell play in directed education?

22. Show how you would test for the four kinds of cutaneous sensation.

23. What part does the sense of touch play in directed education?

24. What is meant by organic sensations? What relationship may there be between them and tactile sensations?

25. What are kinæsthetic sensations and of what importance are they in human behavior?

26. What is the place of the kinæsthetic sensations in learning?

27. In building percepts what three facts should the teacher keep in mind?

28. Give an original illustration of the use of the demonstration method. Of the project method. How are the two combined?

29. Give six different kinds of special perceptions and indicate why each is slow in developing.

30. Cite from your own experience an example of an illusion

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CHAPTER IV

Attention and Interest in Education

Instead of thinking of consciousness as a stream, as previously suggested, perhaps its manifestations can be better understood if we think of it as an ocean, the white crests of the waves representing concentrated attention and the marginal walls of the waves representing inattention. No state of consciousness is unaccompanied by attention, and inattention is simply a shading off of the latter.

The problem of this chapter is to point out the various factors of attention, its "forms," its bodily accompaniments, the place of distraction, the relationship between attention and interest, and the various methods for redirecting attention and interest.

THE PSYCHOLOGY OF ATTENTION

Whether or not one learns depends upon the amount of adaptation he succeeds in making. Adaptation is adjustment to situations, to stimuli. When one attends to a stimulus, either naturally or through promptings, he adapts himself to it, and, to the degree that he is inattentive, he is out of adjustment. While out of adjustment he is still aware of, i.e., *conscious* of, things going on about him; he has a general awareness of the situation but is not giving full attention to it.

Meaning of Full Attention.—Since learning demands adaptation, it is not so much concerned with general aware-

ness as with full or concentrated attention, and concentrated attention is the result of selection. Only one attentive response is possible at the same instant of time, so we select the thing to which we shall give notice. The adjustment we make includes not only fixation of the sense organs to receive the full effects of the stimulus but of the body in general; we are intent upon receiving the stimulus; we are in full adjustment to some one thing or event. With the situation-in-focus conscious in the highest degree, general awareness of other things is subordinated.

Attention and Habit.—Inattention sometimes gets in the way of selection, because of habits previously formed. If one is completely familiar with all the details of a situation, or even assumes that he is completely familiar, habitual reaction substitutes for active attention. Elements of newness are lacking and responses take place on the lower levels.

For example, a student who has been compelled to repeat a course will sometimes fail to pay full attention to the lectures because, having sat through them before, he finds them completely familiar, without newness and without challenge. He falls into his old way of reacting—slumps in his seat, reads a book, writes a letter, or goes to sleep. The things he should select for full attention are not at the moment of supreme significance. On the assumption that everything is familiar, he even fails to grasp the important points which, had they been in focus the year before, would have made repetition of the course unnecessary.

Limits to Range of Attention.—If inattention is but the shading off of attention it seems that we should be able to attend to many things simultaneously, but there are limits

to this and, ordinarily, the things must be related in some way. For example, let us take a student's attention to the playing of a rhythmic selection by the school orchestra. The attention he pays to the selection is concentrated on the theme, the swing and sway of which carries him along without effort. In this type of attention there is much inattention—a shading off to the seemingly casual and incidental intersonants of the various parts. A change in theme carries him toward the crest of the wave, and a violent change all the way.

The same thing is true if a solo part is introduced. If it is piano or violin, habit interferes and he does not reach the crest; but, if it is an unusual instrument such as the celesta, or one played extremely well by but few, such as the flute, he is at the top of the wave again. These things to which he is attending are related, but, if a fire-engine, with siren in full operation, rushes by, his attention, with most of its marginal appendages, is transferred, and he comes back to the concert only when the sounds of the siren die out.

Fluctuation of Attention.—Attention fluctuates, i.e., the process of perceiving or thinking is not continuous but is a series of pulses. This is true despite any attempt to prevent it. Attention comes not only in waves but in rhythmical form. This fact is easily demonstrated by the use of a watch. If the watch is placed far enough away that it just can be heard, the sound of the ticking will fade and return. The ticking itself has not changed in strength; attention has ebbed for a time.

Through laboratory experiments Seashore has shown that these waves of short duration are but parts of longer ones—rhythm within rhythm. Measurements on long periods of attention show that there may be waves as long as an hour;



FIG. 9

The above spot can be used both for a test of after-sensation and for a test of the fluctuation of attention.

For after-sensation, fixate the spot for from 5 to 20 seconds, then turn and look at a neutral surface, such as a gray wall. For a few seconds you will see the spot not black but white.

For fluctuation of attention, fixate the spot until you are conscious that it has momentarily disappeared.

smaller waves, reckoned in minutes, may be traced inside of these; and within the minute-waves we find second-waves. There are infinitely short ripples of attention, hardly perceptible; these form the surface of the ripples, which in turn form the surface of wavelets; and these wavelets in turn form the surface of waves. Thus all attention is rhythmic and there is rhythm within rhythm from the infinitesimally short to the very long, even daily and annual periodicities.

Pillsbury states that the extreme limit during which one may attend to the same thing or to the same phase of a thing is probably in the neighborhood of a second. By looking constantly at a black dot in the center of a white piece of paper, one will observe a fluctuation after a short interval. He will keep the dot in mind for a second, then he will wonder if he has been looking at it, will see it again, a strain in the forehead will attract him to it, and so on. Meanwhile sensations from other organs, thoughts, and memories will have inserted themselves, perhaps fifty or more objects and ideas having passed through consciousness in a minute. This is explained by the fact that each pulse of attention corresponds to a discharge of a nerve cell which is incapable of action for a second or more, after which it may act again.

Seashore points out that the length of the second-wave varies with numerous conditions—kind and strength of stimulus, practice, temperament, psycho-physical condition, and effort, a single crest of attention being maintained for not more than ten or twelve seconds, and an average of from six to eight seconds for a complete second-wave being about normal.

Change of the Stimulus.—In selection, one object usually has an advantage over another and there are several factors of advantage, of which *change* is perhaps the greatest. A

steady noise, such as steam escaping from a radiator, is not noticed after a time; one becomes adapted to it; but if it ceases or changes in character, attention is drawn to it at once.

Attention once gained will naturally fluctuate or ebb and in the classroom this will be shown in the child's bodily attitude. He becomes restless, looks away, or slumps in his seat. He is fatigued. Rest is needed and, for these minor fluctuations, change is necessary. Here, therefore, we may insert this rule: *at first signs of ebbing attention resort to change either in the subject-matter being presented or in the method of presenting it.*

To change the subject-matter is not always easy or advisable. The course of study demands that certain materials be presented, and the time schedule and daily lesson plan call for presentation at specified times. To abruptly change to something radically different invites administrative difficulties, but the lesson plan should be sufficiently elastic to permit a reversal of presentation, provided such reversal will secure the right attentive responses. For example, if the teacher is presenting a selection from literature, another such selection taken from the course of study may be substituted; or the children themselves may be asked to make the interpretation; or the biography of the author may be used to recapture attention. No progress is made without the attention of the children and any reasonable change should be within the teacher's right.

Strength of the Stimulus.—One must attend to sudden loud noises and bright flashes, such as accompany a spring thunder shower, and here the factor of advantage is the *strength* of the stimulus.

Unusually strong stimuli, such as sudden and loud noises,

have a limited use in education. To secure attention at the beginning of a lesson or a class period some teachers find it necessary to ring a bell or rap on the desk. This method of securing attention is usually successful but its use is questionable and is ordinarily indicative of a wrong start and a general lack of interest on the part of the pupils. Other teachers secure attention by shouting or even by whispering, sometimes attempting to sustain attention by such means, overlooking the psychological advantage of change. Still others refuse to begin a class discussion until the gaze of every child is fastened upon the instructor.

That teacher is fortunate whose personality makes such expedients unnecessary, whose bearing or the sound of whose voice attracts attention immediately; but there are not many in this category. Strong stimuli will therefore continue to find a place in education, but (and we have this rule): *strong stimuli should be limited to situations in which ordinary procedure fails and in which immediate and strong reaction is urgent.*

Repetition of the Stimulus.—*Repetition* also has its place as a factor of advantage. Announcements and fire-drills are repeated so that attention will be awakened to desirable modes of behavior.

In trying to establish habits of attention, repetition is often used to advantage. For instance, when an announcement is made, several children may be inattentive (their minds on something else). The reaction time of some children is very slow, and some, even when quick to react, are slow to comprehend. Announcements intended for all should therefore be repeated, particularly if there is likelihood of confusion in meaning. As an example, take this type of announcement, intended for a group of school children:

On Friday morning, just before Christmas holidays, at 8:30, each of you is asked to bring some old clothes, some canned goods or fresh vegetables, or, in the place of these, some money, to be distributed among the poor and the unemployed.

Only those children with some previous knowledge of the plan will, upon first announcement, catch the import of the request and retain its details. Others will "get lost" at the mention of Christmas holidays; this will set them thinking about the good times they anticipate. Some will not be able to remember the items listed and whether or not they are to bring everything mentioned or just one thing. Some will be confused as to the time to bring the donations; others over the terms used—who are the unemployed?

The announcement must be repeated; perhaps reworded; to write on the blackboard the list of items desired and the time they should be brought will help to fix the details.

The same is true of drills of various sorts. *Any activity in which coördination and coöperation are expected must be repeated until perfected and the only way to guarantee this is to repeat the stimulus.* The fire-drill is a good example. There must be instantaneous response. The child must react to the alarm until the habit of reaction is spontaneous, i.e., until he has formed the habit of paying immediate attention the moment the bell rings.

Striking Quality of the Stimulus.—When attention is drawn to saturated colors or high notes their *striking quality* is the arresting factor. ✓

Some kinds of stimuli gain attention where others do not. Children and many adults are easily attracted to tinkling sounds, the babbling of water, the high soft notes from the human voice or the musical instrument, saturated colors or color combinations as in Scotch plaid, and to pantomime and

imitation. To help secure attention in the classroom, therefore, *objective material or subjective content should be presented in such a way that striking qualities will be brought out.* The striking quality in a work of art, for example, is sometimes color, sometimes perspective, sometimes lights and shades, sometimes the medium used. Any and all of these should be used to gain attention to the work itself.

Definite Form of the Stimulus. — *Definite form* will arouse attention where other factors fail. A cloud shaped like an animal or a human head will attract the eye much sooner than the expanse of clouds of which it is a part.

As brought out in connection with teaching for percepts, the child will grasp the meaning much sooner if apt illustrations are used. They employ the factor of clearness or definite form. They bring the lesson home to the child. They hold his attention because they stimulate his senses. *Objects, pictures, or appropriately-familiar situations should be used to get the point across to the child, but they should be within his comprehension.*

Following close upon the use of illustrations is the interjection of the story. Through the story, as has been stated, appeal is made to the child's primitive curiosity. There is no better way for recapturing attention when it has ebbed, but the story should be illustrative of the point to be made and should not only be based upon the experience of the child but presented in a terminology he will understand.

There is a caution here for inexperienced teachers. As is well known, children in the primary grades so thoroughly enjoy stories they can understand that they will ask for many repetitions. The inexperienced teacher may overdo the story-telling phase of the work because it does hold attention and stimulate interest. Whether it be in the primary grades, in

the upper grades, or even in high school, the teacher must keep in mind that the story is a tool for arousing and holding interest, that it has its place, but that *the story should not be used too frequently else the subject-matter will lose its importance and the main goal of teaching disappear from view*. Particularly is this true of the "funny" story. The teacher who overdoes the "funny" story is guaranteed some popularity among the pupils but usually fails to gain their respect as an instructor. Unfortunately he seldom rises above the level of the stories he relates.

This is not to say that the development of a sense of humor in children is to be neglected. It certainly is as important as some of the factual material the teacher must impart; but the school does the child an injustice if it gives him a sense of humor and nothing else. When he begins his life work he will be expected to be serious, and his sense of humor ordinarily will find outlet only in social situations.

Habits of Attention.—All the above five factors of advantage tend to establish habits of attention. The child learns through them what is worth noticing and what is not, and learns to sustain his attention, limited only by the rhythm supplied by nature.

Physical Concomitants of Attention.—If one fixes his attention upon his little finger for five or ten minutes, says Ribot, he will experience certain distinct sensations—suffering, arterial pulsations, heaviness, or crawling. This is explained by the fact that the finger is really the seat of a sensation which the act of attention increases.

When one puts forth the effort to attend, the rhythm of respiration changes, slackens, and sometimes stops temporarily. To acquire the power of attention he must alternate his

mental adjustments with the rhythmic movements of breathing. Yawning, after a long effort at attention, is evidence of the slackening of attention, and taking a deep breath after a like situation shows that breathing has been unnatural during the effort. Sighing, common not only to attention but to physical and moral pain, provides oxygen for the blood narcotized by the stoppage of breathing.

When one is trying to pay close attention the forehead muscle contracts and lifts the eyebrow, producing wrinkles on the forehead and opening the eyes wide. Sometimes the mouth opens and the lips are protruded. The reverse of this is seen when one is reflecting on some serious problem. Then the eyebrows are lowered, lines appear between the eyes, and the latter are veiled or completely closed. The mouth is closed, the lips usually set as though to hold the effort.

Other bodily accompaniments of the effort to attend are: walking to and fro, striking the forehead, scratching the head, rubbing the eyes, craning the neck, sitting erect or forward on the seat, and moving the legs and arms in rhythmic fashion. Some of these, however, serve as relief from attention to things annoying or difficult of comprehension. To escape an uninteresting lecture one may purposely engage in some motor activity—drum on the arm of the chair, or move position, or cough, or draw pictures, or count the persons present, anything to increase the brain's activity.

Children soon learn that they are expected to pay attention to the thing at hand and some of them succeed so well in building habits of bodily attitude of attention that they seem to be following along with the development of the lesson when, in reality, attention has wandered away from the topics under discussion. This is to be expected, even in the ordinarily-alert child; his attention may fluctuate without outward signs. It is usually not hard to recapture.

Sometimes temporary inattentiveness results from a personal application the child is making of the lesson; his mind has "wandered" to his own problems. If so, the lesson has been effective. There is from observation, however, no way to know this and *the child who pays rapt attention to everything said and done should occasionally be tested for simulation. A seemingly chance remark or question should be addressed to him directly.*

Attention and Distraction.—When we select something to which to attend there are always competing stimuli and these, together with the natural fluctuation of attention, make unwavering attention impossible. The mind wanders to others things in spite of all we can do. This may be tested by selecting ten consecutive lines in a paragraph and counting all the *e*'s that appear there. After counting as fast and as accurately as possible, the selection should be retraced and irrelevant impressions, memories, thoughts, feelings, and impulses, which came into the focus of attention while counting, should be written down.

To overcome distraction greater energy may be thrown into the task to be performed. Sometimes this is initiated by stretching out the arms and legs, by rolling up the sleeves, by rubbing the hands together, by taking a deep breath, by gritting the teeth, by reading or speaking aloud, by clearing away all material objects of interference, or by making oneself more comfortable through loosening the clothing or improving the environment. Through most of these actions we arouse the motor centers to further activity and quicken our thinking.

To secure concentration by improving the environment one may overdo it. The student, for example, may provide himself with such a comfortable, well-lighted, well-heated room

and such an easy chair that he finds it impossible to concentrate on his work. The motor centers are not stimulated.

On the other hand, over-stimulation of the motor centers sometimes prevents concentration. While, as Bain points out, a rapid walk or a race will quicken the flow of ideas and words, three hours of football practice or a strenuous basketball game will make effective study next to impossible. The same thing is true even when one has been highly stimulated by social contacts; one doesn't want to study or even sleep; he wants to go right on talking or to go somewhere to eat or to dance.

Sometimes the very distractions which might offset concentration serve to encourage it. By making an active effort to keep from hearing outside noises, one increases his ability to concentrate, and, because his attention is distracted through change in the stimulus, his nervous system may demand the outside noise if he is to do effective work. The nervous system accommodates itself to noise and sometimes is greatly disturbed by the lack of it, constant quiet or the occasional interruptions of constant quiet keeping the system "on edge." If one cannot sidetrack a distraction, the only alternative is to couple it with the task at hand. The "persistent bore" sometimes must be included in the conversation if one is to keep concentrated on the subject under discussion. Similarly, the little dog that runs after the ball each time you toss it to your friend may serve as a distraction until he is included in the game.

One of the important things in teaching is to avoid distractions wherever possible. Common distractions are poor lighting, poor ventilation, and outside noises, and occasional distractions are the proximity of certain other pupils and the teacher's demeanor and her manner of speaking.

Attention cannot be held if the child is annoyed by bright

sunshine when the rest of the room is comparatively dark, or if he is straining his eyes looking into or under a bright artificial light. Again, should he be seated near an open window through which come loud noises from the outside—street cars, trains, automobiles, a barking dog, a bawling cow—try as he will, he has difficulty in attending to the thing at hand.

As for the teacher, her best address is that described as business-like, not over-serious, not over-friendly. The child recognizes and respects the authority of the teacher who has herself well in hand. This means that he is prepared to give attention to what the teacher has to say.

The teacher's voice should be well modulated. The rasping, shouting, or mumbling voice is a strain on the nervous system and the child naturally tries to throw it off, to get away from it by attention to other things.

If she would gain and hold attention, therefore, the teacher should *avoid distractions by providing proper lighting, seating, ventilation, and freedom from outside noises, by maintaining poise under all conditions, and by speaking rhythmically, not too low, not too loudly.*

Attention and Will.—Will, a conscious control of habit formation and a factor in inhibition, is also one of the controls of attention. It is responsible for voluntary attention by providing the element of effort. It makes attention dynamic. It determines that to which one shall pay attention.

If it were not for will one's mind would not mature. We see occasional examples of this among persons who have lacked the necessary resolution to learn and to profit from learning. In some cases their thinking has been done for them; in others, provision has been made for all their wants and there is little or no need for the exercise of will; and, in

a few others, there is evidence of a low degree of comprehension, an inability to "make up" one's mind because of inherent shortcomings. Attention is difficult to secure from these; the will to do cannot be aroused by ordinary means.

To combine will and attention we must provide tasks that require resolution and exertion. *The child must be encouraged to stay with a thing until it is fully accomplished.* In doing this the effort he puts forth results in immediate habits of skill and in a relatively permanent habit of voluntary attention. By learning to "try hard" at each task, he becomes ready, alert, willing, and eager for more tests of his ability.

Putting forth effort, however, may take the form of exertion without special reference to an objective. It may serve the purpose of making attention voluntary but alone does not serve the end toward which voluntary attention is to be directed, and no lasting habits of voluntary attention can be built unless incentives for improvement are utilized. The will to learn, i.e., the will to attend for the sake of the future, must be stimulated by setting up desirable goals. The child must develop a zeal for the work to be accomplished.

To develop a zeal the child's impulses should be directed toward ideals and his activities pointed toward objects of desire. He must have a motive, i.e., an urge, a drive, a desire, a purpose. The purpose may originate with him or it may be suggested by the teacher, but it must be there.

ATTENTION AND INTEREST

Interest may be defined as attention with a sense of concern. The concern may be instinctive in character or may have resulted from training.

Instinctive Interest.—A young child attends to those things which interest him; he attends when his curiosity is

aroused; but his attention is without effort. He gets pleasure from attending and we speak of that pleasure as interest.

To illustrate: A boy is ambling down the street twirling a stick. Glancing across the street he sees a crowd of children gathered around some object which holds their attention. His curiosity aroused, he throws away the stick and starts forward on the run, dodging obstacles; when he arrives he pushes some of the children out of the way so that his field of vision will not be obscured. He is "all attention."

In the center of the group is an organ-grinder and his monkey. The monkey is eating peanuts and tipping his hat repeatedly. This fascinates the boy. He becomes intensely interested and remains to pay close attention to everything the monkey does.

Often we get interested in things before we begin to concentrate upon them and it is difficult to say whether interest or attention has come first. Always, however, interest must be preceded by perception—the giving of meaning to sensation—and, in that sense, the motor acts of attending must come first. Only when interest stimulates more and greater attention may we say that it comes first.

To paraphrase James Bryce, differences between the child who succeeds and the child who fails are not so much differences in capacity as they are differences in interest and activity.

The child is born with a tendency to be active in some way at all times and, if this natural tendency is to be transformed into attention, use must be made of instinctive interests. Specifically, we must *make use of interests in construction, interests in social approval, and interests in rhythm, jingles, phonics, words, and games*. It is easy to keep children active along these lines. It becomes difficult only when the prob-

lem presented is so far removed from the child's experience that it is beyond his comprehension.

Acquired Interest.—We can best explain acquired interest by giving another illustration.

A girl is required by her parents to study voice culture. She finds the early lessons tedious and without immediate interest, but, by continuing, she learns to attend to them because they promise to lead to something desirable later on—by being able to sing well she will be the center of attraction in social groups, or perhaps some day she will appear upon the concert stage; possibly she will be asked to broadcast. (The instincts of self-assertion and desire to win social approval are active.) She becomes actively attentive to the task of learning to sing.

Presently she finds that she does sing well. The technique mastered, she exhibits fine control. She begins to appear in public and is received cordially. She now has a great interest in her music. It is an *acquired* interest, resulting from active attention to her work. Moreover, because she performs so easily and so well, active attention is no longer required; singing has become "second nature."

Appeals to instinctive interests resulting in active attention build up acquired interests. However, the things in which we wish a child to become interested may make no direct appeal to him. Connection must be made between these and the things which arouse his instinctive interests.

Any object not interesting in itself, says James, may become interesting through becoming associated with an object in which an interest already exists. We spoke of this in connection with the use of objects in building percepts. Here we have not only the problem of imparting right meanings

but also that of developing acquired interests in things and situations the child should know and experience but to which he attaches no significance unless right associations are made.

Some of the child's instinctive interests may be negative in character and may develop into disturbing elements in the classroom or outside. Teasing or tormenting smaller or weaker children, or playing the smart-aleck before the group are common examples. Not always are these tendencies easy to redirect, as is sometimes implied. The simple expedient of "putting the child to work" is not always a solution; interest must first be created in the thing at which he is caused to work, and it is created through well-planned, or sometimes accidental, association.

In developing acquired interests, the teacher should *connect the objects and experiences used in appealing to instinctive interests with the later objects and ideas to be instilled, seeking out associations which will make some appeal to each child*. For example, the group may be asked whether the chalk with which they write may be classified as stone; then it may be explained to them where real chalk is to be found and how the chalk they use is manufactured.

Interest and Sustained Attention.—Many of our temporary adjustments are determined by momentary interests, but when we sustain attention we are stimulated by more or less permanent interests. We get interested in a story because of its personal appeal or because of the sympathy it arouses and our attention moves along with the lines on the printed page or with the voice of the speaker. The chief character of attention here is that it is mobile; while persisting, it is not stationary; it moves from point to point. It can be sustained only through a continuity of interest.

Interest aroused to activity by some stimulus persists for a while, calling up some selected responses and inhibiting others. Whether it be personal, sympathetic, or intellectual in character, it clings to the theme of the story or to the thread of development of activity until the goal is reached, or until curiosity is satisfied, or until some greater interest supplants it.

In earlier generations teachers relied upon fear as a motive force in sustaining attention and that practice has not completely disappeared in our own generation. Attention gained through fear, however, is ineffective in the sense that interest in the subject dies out when fear is dissipated. *Only in situations in which the child is in immediate danger of physical harm or injury should fear be used to gain his attention.*

Some teachers have used the mastery impulse with success in sustaining attention. The competitive element is important in arousing interest, as we shall show, but ordinarily it will not sustain attention for long in the subject to be learned, nor will the urge to master a subject for the sole sake of mastering it.

The ideal way to sustain attention in subject-matter is to develop an absorbing interest in it. For the child this is not a simple thing to do. The subject may make no appeal to either his instinctive interests or his acquired interests. *Begin, therefore, by arousing the child's curiosity and his desire for approval, using his natural fear of blame and his hope for reward to carry him along until, having made an effort to master the subject, the subject-matter may become interesting in itself.*

After all, whether or not a child becomes interested in a subject depends upon how it is taught. There is no school subject that cannot be made "dry" and uninteresting. A positive dislike for literature, or history, or spelling, or

geography can be created in a very short time by the teacher who lacks knowledge of the subject-matter or of the right methods for presenting it or who lacks enthusiasm for the work of teaching.

On the other hand, there is no school subject that cannot be made absorbingly interesting by the teacher who is willing to seek out its interesting phases and to teach with such originality that fresh stimuli to interest constantly appear. Most children dislike mathematics and find the subject difficult to master, yet there are teachers who make of mathematics a succession of "hair-breadth escapes," an exciting story of the development and use of number. This is not done, however, unless the teacher is vitally interested in the subject and equally interested in the children under instruction.

Interest and Rivalry.—Rivalry plays an important part in the development of interest. In fact, rivalry may be thought of as an instinctive interest and, in that light, its use is general.

For example, a high school girl slightly less attractive than her most formidable rival develops active attention to the process of making herself more attractive, either through artificial means or through the development of mental qualities meant to overshadow physical charm. She begins with an instinctive interest which leads into active attention. Through active attention there is possibility of acquired interest along each of two lines: she may become interested in keeping herself beautiful without an immediate goal, or she may develop an interest in learning for the sake of learning.

That the normal child is strongly ingrained with the habit-forming ability of rivalry is shown in the fact that he can-

not for very long attend to or maintain interest in an activity in which there are no competitive elements.

The value of rivalry is centered in bringing to the child's attention a variety of activities and in stimulating his efforts. Thus is he acquainted with the degrees to which he may hope to master the different kinds of activity. His successes, in addition to the skills derived, contribute to his self-esteem, and his failures should contribute to his respect for others.

There is danger, however, that this may be overdone. So long as the child is stimulated by some successes interest may be held, but, if he meets with failure in all trials, not only may self-esteem and respect for others be abandoned but interest in the activity die out. In such event it is best, as recommended earlier, to *stimulate interest by having the child try to improve his own records.*

Interest and Effort.—When one attends actively to the task at hand the muscular contractions characteristic of the first trial and also the feeling of effort disappear. The same is true when one becomes interested in the task.

For example, the student who sets aside certain hours for study and actually applies himself during those hours finds presently that the act of studying has become relatively easy and that he himself has become interested in the subject-matter. Thereafter he will neither find it difficult to accomplish his work nor embarrassing to report upon it.

In education no problem of instruction is greater than that of teaching the child to build good study habits. Among those who learn to study, no two children follow identical procedures. It is therefore next to impossible to draw up a set of rules for universal application. There are, however, a few rules which apply to all—rules which are intended to

stimulate attention and sustain interest. They are as follows:

1. *Give the child a definite knowledge of what is to be studied.*

2. *Cause him to plan a daily study-program, setting aside certain hours for the purpose.*

3. *Encourage him to set up aims for the accomplishment of all tasks.*

4. *Arouse in him a desire to perform each task for personal benefit.*

5. *See that he has regular meals, regular sleep, and regular exercise.*

6. *See that he observes proper rest periods.*

7. *Get him to outline each lesson studied.*

8. *Teach him to make immediate application of materials learned.*

9. *Teach him to articulate each day's lesson with that of the day preceding and of the day to follow.*

10. *Train him to listen for suggestions for study.*

Two Important Tasks. — It is evident that successful teaching in itself results from the accomplishment of two important tasks: (1) to secure attention to and interest in the subject-matter offered; and (2) to teach the child to study so effectively that interest in each subject will be sustained to the end.

Much progress is being made along each of these lines. The school is becoming more and more attractive to the child; he hesitates to miss any of its sessions; it is an *interesting* place to be; even its study requirements are but occasionally disheartening. This is because teachers themselves are learning methods for making right appeals to attention and interest. The only danger lies in the use of devices that

are in themselves so interesting the subject-matter is lost. It should never be necessary for the child, as Bagley has phrased it, to "get his factual material through 'bootleg' channels."

QUESTIONS AND PROBLEMS

1. Show, by original example, how attention varies from concentration to inattention.
2. Show how habit may stand in the way of full attention.
3. Why is it that we cannot attend to many things at once?
4. Show by example how attention comes in rhythmical form.
5. What happens when you try to keep your attention fixed on a white dot on the blackboard?
6. At first signs of ebbing attention what is the thing for the teacher to do?
7. How are unusually strong stimuli used in the classroom and how should they be used?
8. What is the place of repetition in gaining attention? Give examples.
9. How can you use striking quality to gain attention?
10. Describe the use of illustrations and stories in gaining and holding attention.
11. What dangers lie in the use of the "funny" story?
12. What are the physical concomitants of attention?
13. In teaching a class you are conscious of the fact that one child seems to be paying attention but, in reality, is not. What will you do to make sure?
14. What are the effects of distractions and how are they overcome?
15. Show what the teacher's voice and manner have to do with capturing attention.
16. Differentiate between fatigue and ennui in paying attention.
17. How is attention affected by will and how can you increase the efficacy of attention through will power?
18. What can be done to develop a zeal for work?

19. What is meant by instinctive interests and how are they used in the classroom?

20. What is meant by acquired interests and how are they developed in the classroom?

21. Show the relationship between interest and sustained attention.

22. What part does rivalry play in attention and interest? Illustrate.

23. What is the place of competition in the development of interest.

24. What is the best way for sustaining attention to subject-matter?

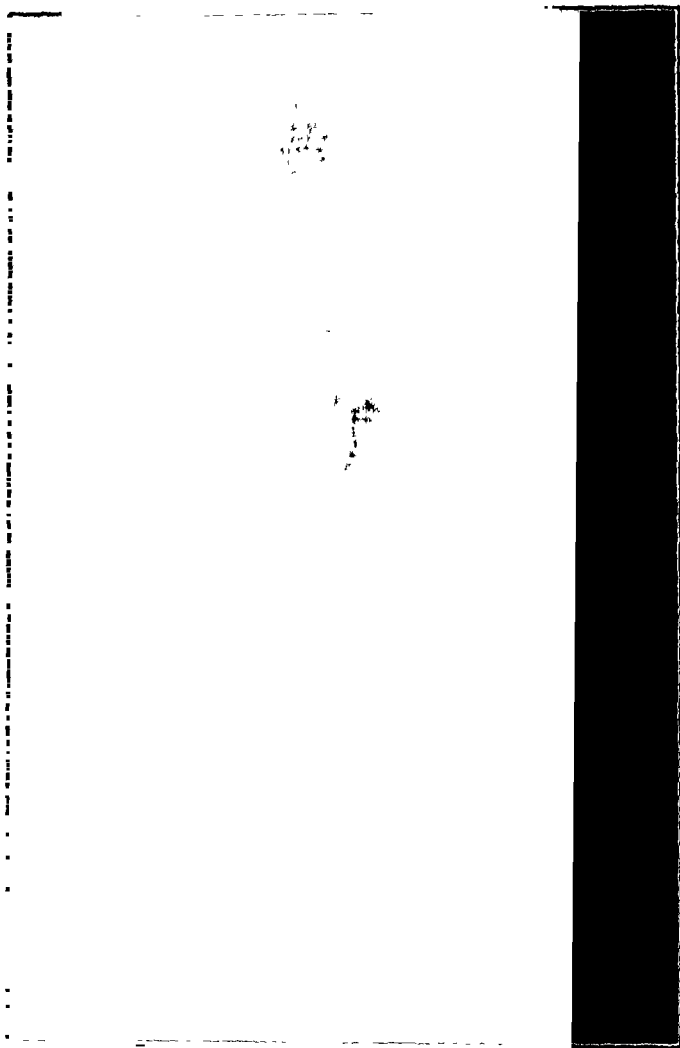
25. Give ten rules for study that may be applied universally

26. What are the two important tasks in good teaching?

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CHAPTER V

Conditioning of Feeling and Emotion

When one pays attention to things which interest him most he cannot avoid a feeling about them. He likes or dislikes them, looks forward to them with pleasure or displeasure, dreads their approach or anticipates it with joy. He seldom, perhaps never, experiences absolute indifference, and often, when stimuli are intense, he gives way to emotions and his bodily responses are indicative of the extremes of feeling—extreme pleasantness or extreme unpleasantness.

Feeling and emotion, therefore, are always to be considered together and it is the purpose of this chapter to show the relationship between the two, their relationship to other conscious states and to instincts, to point out the fundamental emotions, and to indicate the ways in which affective tone may be conditioned.

THE NATURE OF FEELING

Feeling may be said to be instinctive in the sense that we have certain predispositions to feel things to be "instinctively repulsive" or "instinctively agreeable." Again, feeling is related to habit: first, as a foundation for habit—a pleasant act is repeated and an unpleasant one inhibited; and second, as a moving force in habit—we fall into habits of feeling about things which are or which happen.

It must be noted, however, that feeling does not take place

on the lower levels of instinct and habit; it is distinctly a conscious state.

Feeling and Other Conscious States.—Feeling is related to sense-perception, attention and interest, and imagination and memory. It is fundamentally dependent upon sense-perception. For example, the feeling one experiences when he smells a strong odor is partly dependent upon the strength of the sensation and partly upon the meaning he gives to it. Because of its strength the odor is irritating and in that sense unpleasant, but, for instance, when it is interpreted as the odor of burning rubber and, particularly, rubber that should not be on fire, the feeling of unpleasantness grows.

The only way one could determine whether or not the rubber should be burning would be to pay active attention to it, to show an interest in it. In paying attention to it and in interesting oneself in it, feeling is modified by further information or by clearer meaning. Feeling is therefore also dependent upon attention and interest.

Imagination and memory have much to do with feeling. If, for instance, one is driving his car when he detects the odor of burning rubber, he is pretty sure to imagine his brakes are burning, and his feeling about it may be influenced by the memory that he at one time did burn out his brakes. Memory functions in feeling also when one remembers that he does not like the odor of burning rubber.

Theories of Feeling.—Feeling is difficult to trace to any single source and this fact has given rise to three theories of feeling. These are as follows:

1. *Feeling is the accompaniment of an instinctive response.* Pleasure is an instinctive indication of benefit, while unpleasantness is a warning of danger.

2. *Feeling is dependent upon the past experience of the individual.* When unpleasantness is experienced with a previously beneficial stimulus, a transfer of feeling is induced and the beneficial becomes unpleasant.

3. *Different types of feeling are related to bodily changes.* The response of a well-nourished nervous system is pleasant, that of the under-nourished unpleasant.

Organic Feelings.—We have stated that organic sensations, such as hunger and thirst, are fused with other parts of consciousness and, for that reason, little is known about them. Little is known also about organic feelings but the name persists in order that the "tones" which result from internal organic processes may be designated. When, for example, one has eaten a satisfying dinner a feeling-tone continues for some time after the tastes have been displaced. Since the taste-buds start a flow of saliva to help the digestive process get under way, this feeling-tone (well-being) is directly related to the special sense of taste, but, as is true of all feelings, has no special receptor of its own. This type of feeling is described as "general sensibility" and varies to the other extremes, a feeling-tone of ill-being.

It is obvious, therefore, that organic feelings result from organic sensations and we have already pointed out that the organic sensations are to be modified if satisfaction is to be gained from learning processes. When the organic sensations are right effective learning does not always take place but the chances are good that it will. To insure the right organic feelings the teacher cannot correct physical defects nor provide the proper foods (milk, cereals, eggs, fresh fruits, vegetables and greens, bread and butter, and meat) but she can *inform the school nurse or the parents of indications of malnutrition.* The common causes for malnutri-

tion are: fast eating, unbalanced diets, the sugar habit, omission of rest periods, obstructions to breathing, and the use of tea and coffee. The teacher can also *provide one hot dish for the child who must bring a mid-day lunch and encourage all to drink milk, orange juice and other nourishing liquids*. Not only does the child who is well nourished do better school work but, when satisfaction results from the process of learning, bodily processes (glandular secretions, digestion, and neural activity) are facilitated.

Feeling Defined.—Sensations and feelings differ in three significant ways. Sensations are vivid while feelings are vague; sensations are localized while feelings are not; and sensations have special sense organs while, as indicated above, feelings have no special receptors.

Woodworth defines feeling as an "undercurrent of consciousness," or "background." While one is giving things their meanings, thinking about them, intending to act, he is feeling calm, or excited, or expectant, or gloomy, or buoyant. Feeling is acting as a conscious control of consciousness itself.

Bodily Signs of Feeling.—One has a tendency with pain or unpleasantness to crouch, pull away, or draw together, while, with pleasure, one tends to relax or expand. With unpleasantness one may cry and the mouth get dry, while, with pleasure, the eye is bright and there is an increased secretion of saliva.

These examples indicate that there are certain bodily signs for each type of feeling but some bodily accompaniments go with both extremes of feeling. Constriction of the blood vessels, flush of the cheeks, and quickened pulse and breathing accompany either pleasantness or unpleasantness.

Types of Stimuli for Feeling. —There are two kinds of stimuli for pleasantness and two for unpleasantness. Success is always pleasant and things that are sweet are always pleasant. On the other hand, failure is always unpleasant, as are things that are bitter.

Unpleasantness as a Feeling-Tone.—The feeling of unpleasantness is described by showing its relationship to the sensation of pain. Everybody has experienced pain in some form—hunger pains, growing pains, and pains from injury and disease—pains which give information about the condition of bodily organs and tissues.

Pain is not limited, however, to such a function; it is sometimes characteristic of states of consciousness difficult to trace to lower levels. One finds "pain" in the monotony of repeated performance, or finds it "painful" to think too much about things he does not understand. Distractions provide a temporary "pain" in consciousness, and conscience may give one the greatest "pain" in his experience.

Pain is not to be used as a synonym for the unpleasant. It but produces unpleasantness and does not exist without conscious reaction. Pain is a deterrent; it checks and discourages, and shapes one's behavior, but, in shaping his behavior, it may drive him to greater effort. Some of the best work accomplished has been carried on under conditions of great suffering, through substitution of the pleasant feeling of accomplishment for the unpleasant feelings arising from internal or external disturbances.

Pleasantness as a Feeling-Tone.—It has been said that our chief natural objective is to attain pleasant outcomes. In a sense this is true. We do seek pleasant outcomes to all types of behavior, even when we expect to get some joy from

bringing pain to others; but these are immediate outcomes and result from instinctive interest.

As one gains in experience much depends upon what he has learned to anticipate in the way of pleasant returns. His natural tendency is to indulge intemperately in immediately pleasant activities and he may sometimes accept the agreeable of the moment while fully aware that the disagreeable will be the end result. In fact, he may even seek the pleasant through the unpleasant by setting up obstacles of his own invention to be "painfully" knocked down; in order to gain the satisfaction of accomplishment. We referred to this above, in speaking of work accomplished under trying conditions.

Generally, however, one learns after a time that there are certain duties to perform which, by no stretch of the imagination, can result in pleasantness to himself but they may, he reasons, provide pleasantness for others and this will be sufficient to create in him indirectly and eventually a feeling-tone of pleasantness.

Survival of Feeling-Tones.—The laws of learning make clear that satisfaction causes an act to be repeated while dissatisfaction causes it to be avoided. The feeling-tones which grow out of either, when continued and extended, take one of three general directions: they become emotions, attitudes, or sentiments.

For example, one may experience a feeling-tone of satisfaction in gazing upon a bowl of violets. Neither the sight of the violets nor their faint, fragrant odor may be intensely stimulating; but "a violet by a mossy stone, half hidden from the eye" may move one to emotional outbursts; and continuously pleasant association of violets with one's happier experiences may develop a sentiment about them, i.e., cause one to feel "deeply" about violets, so that finally he may give

way to his emotions each time they are seen, smelled, or mentioned.

At another time a feeling-tone of dissatisfaction may come from an unpleasant odor, such as that of burning rubber in the example previously cited. If the odor is excessively irritating or if one thinks great damage is being done, he may become greatly excited and give way to his emotions or, because the sense organs of smell easily adapt themselves and because the whole system, through repeated experience, is rather easily adjusted to situations at first highly stimulating, he may develop an attitude of toleration toward burning rubber. Thus sentiments growing out of the effect of the odor may be those of opposition or favor. Men have been known to prefer certain odors highly offensive to others simply because they have first grown accustomed to them and then have built up sentiments around them.

There are, therefore, such states of consciousness as feeling-attitudes, in which one is reasonably sure to feel the same way about a thing or situation each time it is presented. Likewise there are such states as emotional-attitudes, resulting from the habit of permitting full sway to the emotions.

Feeling-Attitudes and Feeling-Sentiments. — The feeling-attitude as represented in school situations is best explained by offering an illustration.

A boy in high school wears shoes that squeak very loudly. The teacher sends him to the blackboard and the noise from his shoes causes the other students to laugh. He becomes self-conscious; he tries to walk so that his shoes will not squeak; but he does not succeed. He develops a feeling about the shoes; it is unpleasant. Succeeding experiences cause him to dislike the shoes greatly. He develops an attitude toward them, an attitude based upon feeling.

There is just as much likelihood, however, of developing a feeling-attitude from pleasant experiences and the teacher should *use feeling-tones in building right attitudes toward school work and in the development of sentiments*. The child who likes his school has a feeling about it that easily grows into a sentiment—a sympathy with all its activities, a loyalty to all its causes, an admiration for those who teach in it and for those who attend it. The feeling-tone of pleasantness becomes a feeling-sentiment. In some children the feeling-sentiment grows into a deep and abiding love for the school, characterized by emotional outbursts in its defense, thereby becoming an emotional-sentiment.

Reconditioning of Feelings.—One of the important tasks of education is the reconditioning of feelings. Assuming that there is no interference from organic sensations and that attitudes toward learning are still not right, what shall we do about conditioning—suppress the feelings or permit them to be expressed to the fullest?

All psychologists are agreed that there is danger in the complete suppression of feeling. Freud states that when in childhood a disagreeable feeling is suppressed, carrying with it a host of associated memories, the feeling and its associates are by no means annihilated but will appear in adult life as abnormal mental states. During sleep, when the faculty of censorship is weakest, Freud says, suppressed feelings obtrude themselves in the form of night terrors and dreams involving wish fulfillment. Even in waking life they may determine the direction which activities shall take.

Terman says on this point that suppression of the play instinct and the spirit of adventure may rid us of troublesome pranks and inconveniences but it creates a harvest of vice, crime, and neuroses.

There is likewise danger in permitting full expression of feeling—a freedom from all discipline. Concerning this Pillsbury says: were all suppression to be removed, it would result in complete license to the individual and this would be inconsistent with life in the community. It would be possible if there were but one child to be dealt with at a time; but, with many, the desires of the children would conflict and some must be suppressed. It is better, says Pillsbury, that two children in a thousand should become mentally disturbed than that all should revert to savagery.

Control of Perceptual Feelings.—Our rule on the control of feelings would therefore be as follows: *do not resort to complete suppression of feelings nor permit complete expression of feelings but rather exercise control of feelings.* Control of feelings is to be gained by including the element of satisfaction in each attempt to impart meaning. Let us illustrate with a training situation in which meaning and feeling were connected in three succeeding steps.

A teacher was trying to show the value and use of money as return for work performed. She made it plain that people are paid for their services, in fact, so plain that, having sent a boy on an errand, he demanded ten cents as his rightful earnings. Far-sighted, the teacher gave the boy a dime, thus connecting the element of satisfaction with the meaning to be imparted. At the same time, however, she impressed upon the boy that should the situation be reversed—should she perform some extraneous act for him, he must expect to pay her.

Presently the teacher found occasion to go outside her regular duties in mending the boy's coat. His previous lesson had been well learned. He recognized the service by bringing the teacher a dime, which she accepted, thus creat-

ing in him a stronger feeling of satisfaction in his rôle as employer.

Later the teacher returned the boy's money, explaining that some things are done through love and without reward in money. The lesson sank in. The next day the boy, more satisfied than in the two previous lessons, returned the dime the teacher had given him for running the errand.

Satisfaction through Dissatisfaction.—Due to past experience and to mind-sets already created in the child not all learning situations can result in immediate satisfaction. The teacher will therefore sometimes find it expedient to *secure future satisfaction through immediate dissatisfaction by isolating the child from the group or by inflicting some form of pain most appropriate to the child's nature and needs*. By doing this she balances suppression with expression, with the good of the group in mind.

THE NATURE OF EMOTION

Obviously the relationship between feeling and emotion is close. Emotion is a more intense mental and bodily state than feeling. The fact is, we learn to distinguish emotion from feeling by the observable bodily accompaniments of the former.

Instinct and Emotion.—When one gives way to emotion the movements he makes are due to inborn connections in the nervous system and this means that emotion is instinctive in character. If it is instinctive in character, should it be classified as a mechanical reaction or a conscious state?

Pillsbury answers this question as follows: the emotional *response* is due to the internal movements and sensations of

the deeper lying organs, but the emotion itself is consciousness of the involuntary response of the body to certain stimuli. A stimulus causes a series of responses in the muscles, mainly those controlled by the autonomic system, and the sensory ends in these muscles send back currents to the cortex so that we become aware of the response and of the stimulus at the same moment. The total experience is the emotion, and the important thing to remember in the emotion is that we *feel* rather than that we *do*.

Bodily Accompaniments of Emotion.—The shock of an emotional stimulus, says Watson, throws the organism for the *moment at least* into a chaotic state. At first few adjustments are made to objects in the environment. Then come the instinctive responses: crouching, pulling away, or drawing together. To quote Ruckmick: When we are suddenly surprised, and especially when we are frightened, by some sudden movement in the woods while we are alone, we have not only a tendency to stand still in our tracks but to shrink together. We contract our shoulders and have a tendency to cover up the front of our bodies (less protected by bones and muscles), even to the extent of assuming a slightly crouching attitude.

Controlled by the nature of the stimulus one may throw up his hands in defense, blink his eyes, duck his head, bite, scratch, kick, shout for help, or run away. His facial expression may be that of doubt, fear, disdain, or even joy at actual combat. If he is fearful he may have a feeling of weakness and a cold sensation in the spine, a sinking feeling in the chest and a general trembling.

Fundamental Emotions.—Watson classifies emotional reactions into three fundamental groups—those belonging to

the original nature of man: fear, rage, and love. He has studied their causes and recorded the nature of their physical concomitants, describing emotion in terms of a characteristic pattern.

Watson's study of stimuli which, apart from training, call out *fear* responses in infants led him to conclude that the principal situations which call out fear responses are as follows: (1) to remove suddenly from an infant all means of support; (2) to stimulate by loud sounds; (3) to give the infant a sudden push or a slight shake when it is falling asleep or just ready to waken; (4) to tug suddenly at the blanket when it is falling asleep. The responses are: a sudden catching of the breath, grasping, closing the eyelids, puckering the lips, then crying. These Watson calls "original" reactions. No other stimuli brought out fear so regularly and definitely. Very young children (between the ages of four months and one year), although never having seen the animals before, showed no signs of fear of a black cat, a pigeon, a rabbit, or a white rat. Nor were they afraid of the dark or of people. Older persons, says Watson, *learn* to fear such things; their responses are conditioned—called out by stimuli other than those to which their responses were originally bound, or set up through imitation.

To stimulate *rage* or extreme anger the infant's movements were hampered or restricted in some way. By holding the child's head lightly between the hands or by restraining the movements of his arms or legs, the emotion of rage was produced. The child would stiffen the body, cry or scream, and struggle to escape. If it could not free itself it would hold its breath or scream until blue with rage.

The emotion of *love* in young children, according to Watson, is characterized by smiling, gurgling, and cooing. Sometimes the child moves its arms and legs rapidly; sometimes

lies very still. Stimuli for love responses are: stroking the skin, tickling, patting, and rocking.

Reconditioning of Harmful Habits.—Mary Cover Jones, in studying fear responses, extended the observations of Watson to include older children and a wider variety of stimuli. Seventy children, between three months and seven years of age, were tested in situations especially designed to bring out existing fear responses. A number of stimuli, such as flashlights, mechanical toys, stuffed animals, false faces, darkness, slimy animals, and furry animals were presented under varying conditions. These conditions included: (a) preparing the child for the appearance of the stimulus; (b) arranging for the child to come upon the stimulus unexpectedly; (c) having the stimulus presented by a friendly adult; (d) having the stimulus presented by a stranger; (e) presenting the stimulus in the presence of other well-adjusted children; and (f) having unadjusted children present. The methods employed were as follows:

1. *Elimination through Disuse.* Shield the child from the fear-inspiring object and the fear will gradually wear itself out.

2. *Verbal Appeal.* Reason with the child about his fears, pointing out the interesting and attractive features of the object.

3. *Negative Adaptation.* While the child is occupied, let the thing he fears lie within sight without inviting attention to it.

4. *Repression.* Cause the child to dispose of the fear by ridiculing it.

5. *Distraction.* Present an object or other stimulus so pronouncedly positive in appeal that the child's attention is distracted from the fear-object.

6. *Direct Conditioning.* Associate with the fear-object some definite stimulus which is known to be capable of calling out a positive or pleasant response.

7. *Social Stimulus.* Have the child play with the fear-provoking stimulus in the presence of children of the same age who are not afraid.

Conclusions to be drawn from these tests, based upon the methods in the order given, are as follows:

1. Shielding the child from the fear-object does not work. The fear usually returns with a sight of the object; and the child cannot be shielded from it all his life

2. Verbal assurances are not sufficient defense against a strong fear urge. The more the fear-object is talked about, the more ingrained the original fear.

3. When the stimulations are not too frequent or too drastic, the thing the child fears may be left within sight while he is occupied. He may learn to tolerate it.

4. Fears are often more strongly entrenched through social ridicule and teasing.

5. Fears are temporarily lightened but not completely overcome by inviting attention to other objects.

6. If handled carefully, the child may be caused to lose his fear of an object by associating with it some stimulus which produces a pleasant response, such as food. If not handled carefully, the fear may be increased and the food refused.

7. In attempting to get the child to play with the fear-provoking object in the presence of other children, the child may withdraw at first but the example of the group usually interests him and he forgets his fears.

The Emotion of Fear.—We have mentioned some of the physical concomitants of fear—weakness, crying for help,

flight. Among others are: the tendency to cling to anything when drowning and the tendency to shrink from high places when fearful of falling.

Among young children the commonest reaction is the tendency to flee from dangers of any kind. As they grow older they are taught not to run away but to face the danger and somehow get rid of it, i.e., change the reaction from physical to mental. While in the main such teaching has been successful (by causing the physical manifestation of fear to disappear or at least to diminish), many hidden, subdued, and disguised fears still dominate our thinking and may be detected by one on the outlook for them.

For instance, many persons are fearful of crowds, particularly in theaters, on trains, on boats, and at public demonstrations. Children are not so affected, unless through imitation or suggestion, thus showing that an extremely adverse reaction to crowds is the result of thinking—thinking about previous experiences in which danger was imminent or about the experiences of others.

Other persons are highly sensitive to social contacts. They dread "meeting people" and when forced to do so remain quiet, stammer, say the wrong thing, are very ill-at-ease. Some form the habit of being fearful about everything—fearful if there is to be any personal responsibility or fearful lest there be none. Such a habit grows out of worry (a mild form of fear) and anxiety (a strained or solicitous desire).

Suggestion and Fear.—Most of our fears result from suggestion. A suggestion is an idea or impression accepted by the mind without criticism or thought. It may be employed through subtle effort to gain and hold the attention—carrying a point, making a sale, banishing an obsession, or pro-

ducing a cure—or to strengthen a purpose, such as when one repeats over and over a resolution he has made.

Suggestion may be used with or without conscious purpose. A man says to another: "You are pale. You look ill." His purpose, if he has one, may be that of gaining attention to himself—the other man will certainly listen to what he has to say; or it may be that of making the other man really ill either as a joke or because he secretly dislikes him. The chances are good, however, that these reasons do not hold, that the remarks are intended as a show of friendliness or sympathy.

Whatever may be the conscious purpose or even when there is none, suggestion often undermines our thinking to the extent that we submit to anxiety and worry over insinuating but originally inconsequential things. A child who never has been afraid of the dark, of lightning, of policemen, or of dogs may become fearful of any or of all of these by hearing other children or adults mention the possible dangers in each. Often the suggestion is strongly insistent because it is accompanied by misinterpretation, i.e., wrong meaning given to the remarks overheard.

While school situations in the main do not generate fear some situations do engender violent emotion in individual children and it is one of the teacher's tasks to dissipate it. The emotion of fear is best dispelled by direct conditioning, i.e., *associate the fear-object with some stimulus which produces a pleasant response, or have the child face the fear-provoking situation in the presence of other children who are unafraid.* The teacher can have a direct part in the latter. She should *set examples of courage and coolness.*

The Emotion of Rage.—While the frightened person has a tendency to run from the impending danger, the angry per-

son stays to fight. Running away supplies the muscular response to the emotion of fear and it is almost impossible to be angry while in flight. Having given way to the emotion of anger, therefore, we stay put, our rage increased if the obstacles are great or the fight uneven.

The chief cause for rage is hampering of one's movements, while the signs of rage are the muscular responses to hampering. If one starts to run and is prevented from running his muscles become tense, his jaw sets, his teeth are clinched and sometimes bared, and he has the impulse to strike out with hands or feet. Under this emotion the body attains its maximum fighting strength.

The chief disadvantage of rage is that one is unable to think clearly, except along the one line of removing the obstacles in his path; his judgment is clouded. The man who stumbles over a chair and responds to the pain or delay by kicking the chair out of his way is lacking in judgment; but it is typical of the emotion of anger not to fade until some muscular response has relieved it.

Rage takes different forms and finds its outlets in highly different reactions. Its worst result is murder. Murder, or homicide, is sometimes the outcome of impulsive and excessive anger, sometimes the result of smoldering hate and continued resentment.

Suicide also is often the result of rage. One gets angry with himself. To relieve the emotion, he thinks only of getting himself out of the way; not that he wishes to die; he seeks satisfaction through the act of destroying himself.

Anger nearly always takes on a personal aspect in that it results in personal grievances. The student who gets angry because he receives a failure mark in one of his subjects is sure to blame the instructor, or at least some person other than himself for his failure. Likewise the business man,

hampered by economic conditions, blames the political leader, and vice versa. Individuals are blamed for wars and for labor troubles. To give an issue a personal cause permits the emotion to gain full sway and therefore to finally evaporate with greater satisfaction.

Hatred, envy, and jealousy all are responsible in some way to the emotion of anger. Often these are stirred up in others by persons who hold real or fancied grievances which started with anger. In periods of warfare we are taught to hate those who in any way oppose us, to envy those who have more and to be jealous of those who can do more. Fanned by continued suggestion, our emotions result in violent reactions, so that we sometimes attack and malign those with whom we were previously on friendly terms.

In periods of peace or in our ordinary daily contacts anger often takes the form of self-stimulation. We purposely get angry in order to put forth greater effort. A football player, for instance, unable to gain ground, may look for some cause for losing his temper. Finding a cause, more energy is generated and effective gains, even touchdowns, may result. So it is with the student. He makes a battle, a conflict, of his problems and insures their solution.

Anger perpetuates a conflict. Two students engaged in a friendly argument may lose their tempers and a discussion which should have been terminated in a few minutes is carried into the small hours of the night. In such a conflict victory is likely to go to the one least angry. While enough energy is created by rage to continue the battle, judgment and reasoning power are weakened by the emotion and the resulting one-track arguments are ineffective.

Excessive anger in the school child is usually accompanied by outward manifestations of striking, kicking, jumping, or biting. If the emotion is to be controlled these outward evi-

dences must be redirected into constructive activities or must be substituted for. *When the child gets angry, therefore, try to substitute attractive work, a hike, a handball game, a pleasant song, or whatever may be most appropriate at the moment. For the more violent outbursts demanding immediate action, meet the outward manifestations by holding the child so that he cannot strike, kick, jump, or bite. Let us illustrate the latter.*

A boy in the sixth grade, subject to fits of anger, is told to "clean up" his desk and put his books away. He not only refuses to do this but, with a quick movement of his hand, sweeps all his papers and books to the floor. The teacher goes to him and quietly tells him to pick them up. He refuses, kicks the desk, strikes at the teacher, and tries to bite her hands. Securing him by the shoulders the teacher forces him so firmly into his seat that he cannot move his legs, while, at the same time, she holds his arms close to his sides. Unable to give outward expression to his emotion of anger, the emotion subsides. If it is necessary for this control to be repeated several times, the emotion itself gradually comes to be checked without signs of outward manifestation. In the home this treatment may take the form of a sudden bath to shut off temper tantrums.

The Emotion of Love.—There is a tendency among psychologists everywhere to assign the emotion of love to manifestations of the sex instinct. We all come into life, they agree, with a disposition to be devoted to, or to attach ourselves to, some person or thing; and this disposition, some insist, finds its natural outlet in contacts between members of the opposite sex.

Freud, for instance, places great emphasis upon sex as a motive of human control. He claims to have discovered evi-

dences of the sex instinct in the very early days of childhood and goes so far as to say that love, even of parent and child, undoubtedly has a sex element.

Watson, using the term love as synonymous with affection, good nature, or kindness, limits the emotion to the sensory level by showing that its stimulus, in infants and children, is, as we have pointed out, stroking of the skin, tickling, patting or turning. The child responds by gurgling and cooing and with the extension of the arms. The arms reaction, Watson claims, is the forerunner of the embrace of adults.

Woodworth denies that the sex impulse alone is the controlling force in love. Curiosity for the novel and forbidden is accountable for much of the sex behavior of young people, while, in older persons, the maternal instinct and protective motive often play the leading part in perpetuating mutual interest and affection. The sex impulse, he says, is not capable of deciding what is beautiful—landscapes, for example—nor may the love for music and dancing be wholly ascribed to sex motives, part of the motive force being derived from a love for rhythm, melody, and harmony and for well-ordered motor activity.

One of the distinct characteristics of love is that it is linked to attention. We become interested in the things we love and pay attention to them. Presently and gradually love takes on the character of attention in that it fluctuates in waves. This is fortunate, for otherwise our conscious processes would not bear up under the strain.

In education, whether or not we accept Watson's theory or that of Woodworth, we are faced with the necessity for sublimating the emotion of love in whatever form we find it.

We have already indicated (in Chapter I) the necessary instruction in sex hygiene and in sex education (covering the

sensory level of this emotion) but may add here what Freud says: the end of the emotion must be changed to one that is like the original but of a character permitted or encouraged by society.

With higher levels in mind, the emotion of love is to be sublimated in these ways: *emphasize coöperation, sympathy, kindness, and the care and protection of younger children and animals. Avoid suppression*, for suppression will but create a zest for the forbidden. Also *avoid ridicule*, for ridicule only stirs up anger. As Pillsbury says, there should be no interference with any activity not definitely injurious either immediately or in its later applications. The main thing to keep in mind here is that the emotion of love is to be reconditioned only to the extent that it does not interfere with purposeful and effective learning. It should be used as an ally of learning rather than an enemy.

Intermingling of Emotions.—Just as the instincts do not function singly and separately, no emotion is entirely independent of the others. Shand states that the emotions come in greater and lesser systems and uses the greater system of the emotion of love in illustration. In all love, he says, there is an organization of the lesser systems of many emotions, such as those of fear, anger, joy, and sorrow, besides others. When one loves there is joy over the presence of the object of love; fear that it will be harmed or taken away; anger when it is molested; sorrow when it is gone. Each of these goes back to some primitive origin: joy to the satisfaction of instincts and impulses; fear to the instinctive tendency to flee; anger to the instinctive tendency to fight; and sorrow, through negative self-feeling, to the tendency toward self-abasement. Shand believes that all the primary emotions and impulses are innately connected with the emotion of anger,

since interference with any one of them tends to evoke a display of anger.

Because of the intermingling of emotions we cannot be sure which emotion will burst forth and what form and strength it will have, and it may evolve, through repeated exercise, into a mood—a predisposition to burst into emotion again.

Emotions and the Glands.—When emotions are evoked the glands of the body are often affected. When one grieves the tear glands are active; when he is angry there may be excessive perspiration; and when he is fearful salivary secretions may be inhibited. These are the noticeable activities of the duct glands when affected by emotional states.

The ductless glands may also be affected. The adrenals, for example, are affected by the emotions of anger and fear. There are two adrenal glands, one lying at the top of each kidney. They secrete adrenin which, when the emotion of anger arises, hastens the action of the heart and quickens the circulation, transforming glycogen (a carbohydrate stored in the liver) into blood sugar as a food supply for the muscles. Under this stimulation the muscles, as indicated earlier, attain their maximum fighting strength. The adrenal secretions also serve as protection against fatigue, but have an inhibitive influence upon the digestive organs.

James-Lange Theory of Emotions.—So many of the emotions have bodily accompaniments, and the latter are sometimes so instantaneous, that it is difficult to determine which comes first, the emotion or its accompaniments. According to the James-Lange theory the "stirred-up state of mind" which we call emotion is but the mental effect of the "stirred-up state of body" always present in emotion.

James states that we do not grow tense because we feel anger, but we feel anger because we grow tense; we feel sorry because we cry and afraid because we tremble. The order is as follows:

(1) Something is *known*. An object enters consciousness either from immediate perception or through memory or imagination.

(2) This known thing sets up a deep-seated and characteristic *organic response*.

(3) Feeling of the organic responses as they occur is the *emotion*.

The theory does not stop with the coarser emotions but includes the religious, moral, and aesthetic.

The only possible way to test the James-Lange theory satisfactorily is to cut off sensations from the interior of the trunk entirely. This has been done in dogs and cats with no obvious change in emotional behavior; but the theory gains support in the occasional case of a person who, having lost internal bodily sensations, has also lost the power to experience emotional response.

Advantages of the Emotions.—The nervous system requires emotional response, else emotions would have been dropped out somewhere along the line. From the standpoint of utility, they serve the following purposes:

1. They relieve the monotony of everyday experiences.
2. They sometimes make possible greater achievement.
3. They often eliminate old habits no longer profitable.
4. They often change the thought processes by providing stimuli for inhibitions.
5. They make possible the higher levels of behavior by initiating religious, moral, and aesthetic attitudes.

Disadvantage of Emotions.—Perhaps the most important of the above advantages is the first. The nervous system is burdened with urges and tendencies, and the emotion “blows off steam” and lowers the pressure; but too much of this lessens the pulling power of the engine; it over-stimulates the visceral and circulatory functions; it has a bad effect upon health. Hence the necessity for some emotional control.

Building Habits of Emotional Response.—On the side of “blowing off steam” we find the necessity for *building* habits of emotional response. There are times when it is desirable to arouse emotions in connection with particular situations, and this may be done by: (1) connecting with feeling ideas which have supplied emotional stimulus in the past; (2) communicating emotion through imitation; and (3) arousing the bodily responses characteristic of the emotion.

Cheer leaders employ all three of these methods. In “pep” talks they stir the feelings by reminding the students of great teams and great accomplishments of former years. They communicate emotion through working themselves up to high pitch. Their chief weapon is bodily movement intended to give conserved emotion early and extensive expression.

The teacher may employ these methods with lesser violence. She should *use suggestion here and there to promote enthusiastic response and to permit the children to “blow off steam.”* Especially is this necessary and profitable in the fields of aesthetic, social, and religious experience, and nowhere is it better exercised than in the period of adolescence when physical changes demand emotional expression.

Emotional-Attitudes.—In building habits of emotional response the teacher should *guard against the creation of emotional-attitudes because of their enervating effect*. An illustration of an emotional-attitude is this: A girl in the eighth grade has difficulty in articulation. The teacher asks her what would happen if a child, not knowing the result, should eat dried apples and drink a great quantity of water. She tries to answer, "He'd soon learn." What she succeeds in saying is, "He'd loon searn." The other children laugh and continue to laugh, poking fun at her each time they see her; and each time the emotion of anger seizes her. She is angry not at them but at her speech difficulty. She develops an attitude toward it, an emotional-attitude.

Best Use of Emotions.—The emotion's best use lies in the promotion of ideals. It is based in feeling, and an ideal is an idea plus feeling. *Emotional behavior should be logically redirected, therefore, into channels of aesthetic pleasure—appreciation of nature, art, music, and literature—thus developing in the child regulative ideals and providing motives for consistent and continuous effort.*

Development of Moods.—A mood is a relatively permanent state of mind which, as an emotional-attitude, simply may provide for further emotional outbursts, but, unlike emotion itself, does not perturb the mind. *The mood, therefore, like feelings, feeling-tones, attitudes, and sentiments, should be used to build constructive reactions.* Creations of note and compositions of merit nearly always result from appropriate moods. Contrary to popular notion, *moodiness therefore is not always to be inhibited; sometimes it should be developed and encouraged if it is likely to result in creative endeavor.*

Permanent Satisfaction.—The teacher is not teaching for the present time alone; she is building for the future, her main goal being that of initiating permanent satisfactions. The chief permanent satisfactions of life, as given by Eliot, are: health; a wholesome capacity for hard work; and a spotless reputation. Nowhere in the education of the child is there better opportunity to lay the foundation for these than in the redirection of feelings and emotions.

QUESTIONS AND PROBLEMS

1. In what specific ways is feeling dependent upon instinct and habit?
2. Give an original example to show how feeling is dependent upon sense-perception, attention and interest, and imagination and memory.
3. State in your own words the three important theories of feeling.
4. Show by example how a feeling-tone is evoked.
5. In what three ways do sensations and feelings differ?
6. What are some of the bodily signs of feeling?
7. What are the two kinds of stimuli for pleasantness and the two for unpleasantness?
8. Differentiate between pain and unpleasantness.
9. Differentiate between a feeling-attitude and an emotional-attitude.
10. What dangers lie in the complete suppression of feeling?
11. Likewise, what dangers lie in permitting full expression of feeling?
12. Give an original example to show how perceptual feelings may be controlled.
13. Is satisfaction ever derived from dissatisfaction? Illustrate.
14. According to Pillsbury's theory, how are instinct and emotion related?
15. What are the typical bodily accompaniments of emotion?
16. What are the three fundamental emotions as given by Watson?

17. As indicated by Watson's experiments, what are the physical concomitants of the fundamental emotions in infants?
18. What seven methods did Jones use in testing the unnatural fears of children?
19. Show how the emotion of fear arises.
20. How is fear evoked by suggestion? Give examples.
21. How would you go about reconditioning fear in the child?
22. What is the chief cause for, the advantage of, and the disadvantage of rage?
23. How would you go about reconditioning rage in the child?
24. Concerning the emotion of love, how do the theories of Freud and Woodworth differ?
25. How would you go about reconditioning the emotion of love?
26. Show how the emotion of love is mingled with other emotions.
27. Speaking generally, how do emotions affect the duct and ductless glands?
28. What is the James-Lange theory of emotions?
29. What are the five advantages of the emotions? The chief advantage? The chief disadvantage?
30. What is the best use of emotions?

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CHAPTER VI

Improvement of Imagination and Memory

Like all other conscious states, imagination grows out of sense-experience. When one gives a meaning to the sensation which arises from seeing an object, an image is formed in his mind—a *mental image*. The latter persists after perception dies out and differs from perception in that it lacks the vividness, light, and shading of the perception image.

After having been away from the object for a long time, one may reproduce it in consciousness in the form of a *revival image*. The revival image, in a narrow sense of the term, is memory.

It is the problem of this chapter to show the relationship between imagination and memory, by showing how the latter develops from the former, and to show how the uses of the two may be improved.

THE NATURE OF IMAGINATION

In popular thought imagination is often confused with false perception. Illusions are not due to false images but to false interpretation of the object of sensory experience.

Imagination, the imaging of objects of perception or thought, is defined as the consciousness of these objects when they are not immediately present.

Kinds of Imagery.—We can be sure of but two kinds of imagery—*visual* and *auditory*—and, of these, visual is the

commoner form. Images arising in connection with the other senses are so fused with sensations that they cannot be classed as genuine.

Imagination Types.—Seashore describes five imagination types—types in which one kind of imagination is predominant in the individual. These are:

1. *Sensuous*—embodying feelings, biases, aspirations, or fears.

2. *Intellectual*—including logical ideas more or less concretely represented by images.

3. *Artistic*—where objects are represented in terms of remote ideals, such as harmony, unity, beauty, and pleasure.

4. *Impulsive*—where imagery is lacking in logic, poise, and continuity of effort and results in the arousal of emotion in others.

5. *Motor*—where imagery takes the form of the practical or mechanical and lacks the appearance of mental creation, suggesting the effort of the plodder.

Balanced imagination, says Seashore, would be a well-developed symmetry of all of these type-traits.

While one might achieve a balanced imagination, no one would be classified as distinctly of but one of these types. Most persons at various times think in various types of imagery, and this is an advantage in adaptation. For education, the most important of the types are the second and third—intellectual and artistic. These, where allowed to develop or where strengthened through training, are the foundation for all human creation.

Free and Controlled Imagination—Like attention, imagination is sometimes free and sometimes controlled. Free imagination, often referred to as “play of the imagination,”

occurs in moments of relaxation and has no fixed aim; it wanders. Controlled imagination, seen in planning and designing, is directed toward the attainment of some result; it is the preliminary to invention.

Imagination and Day Dreams.—When the mind is allowed to wander but the facts recalled rearranged or built together into a story or a castle in Spain, imagination takes the form of day dreaming or “play of imagination.” Through day dreaming we fulfill purposes and gratify longings and desires by removing ourselves, for the time being, from the realms of reality.

The individual is usually the hero of the dream. He sees himself attacked while walking along a dark street. He hears what the attackers say and hears his response. His fists go out; the combined forces of the enemy are routed; he stoops and picks up their weapons and goes on his way whistling. Although out of reality, the dream is so real that he “awakes” from it whistling.

The original stimulus or motive force of the day dream cannot readily be pointed out but the result usually indicates a starting point with some variety of self-assertion. The dream quite frequently provides relief from nervous tension and organic sensations, although not a direct substitute for the latter. When one is hungry, day dreaming will not provide him with food; when he is cold, day dreaming will not make him warm; but to image scenes in which he is well supplied and well sheltered takes his thought from present unpleasantness and this, in its way, is satisfying.

Imagination and Dreams.—Dreams in sleep are also “play of the imagination,” but they lack the criticism and altera-

tion of the day dream and the inhibition of the usual thought process.

When one is asleep the cortical brain functions are at a low level, the degree of functioning depending upon the lightness or soundness of sleep. Dreams come when sleep is light, as when we are just going to sleep or just waking up.

The causes for dreams, as set forth by Macnish, are as follows:

1. *Things which have interested us during the day.* In the dream these will be pleasurable or the reverse, according to the nature of the exciting cause. If we have been reading or talking of horrible subjects—specters, murders, or fires—they will appear before us magnified and heightened in our dreams, as will pleasurable sensations during the day. If we have a longing for anything we are apt to suppose that we possess it; we achieve impossibilities and triumph with ease.

2. *A revival of ideas heterogeneously mingled.* We do not have, in a dream, any idea the elements of which did not in some form strike us at a previous period. They break loose from their connecting chain and become jumbled together incoherently, giving rise to absurd combinations. Macnish compares this experience to that of cross-reading in the newspapers.

3. *Impressions made upon the senses during sleep.* Noises, the flashing of lights, cold, or heat will start a dream. One hears a loud knock on the door and dreams, in a flash, that the house is falling in; a light is flashed in his eyes and the house is on fire; too much cover will sometimes produce a dream of burning alive; and too little cover will cause a dream of freezing to death. When the covers drop off

entirely, one may dream that he is parading the streets unclothed; or when one gets tangled in the bed covers he may dream he has been tied hand and foot. Dreams of falling are sometimes due to actual falling from bed, sometimes to reading, talking, or thinking about falling while awake.

Problems are often solved and musical selections composed in dreams. This is due to freedom from inhibition common to our waking thoughts. Something is lost; we give up finding it; and the dream tells us where it is. The dream has drifted along without doubt, criticism, or inhibition.

Imagination and Emotion.—A situation existing only in imagination may produce an emotional response. Fear may be generated by imagining something that may happen, or worry initiated by doubting the outcome of something that does not really exist. A man driving a motor car may imagine himself in a terrible accident and become so fearful, because of the play of imagination, that he is unnerved for further driving; or, imagining the roads ahead as muddy, full of holes, and impassable, he may find that he has worried for hours over conditions that have long been remedied.

By putting oneself in another's place, emotions are evoked vicariously. We think of a man about to be hung or another about to receive a fortune and we image the former's hopelessness and the latter's joy. Although knowing neither, we become dejected or joyous according to the image presented.

Limits to Imagination.—All imaginative activity, says Sully, is limited by experience. There can be no such thing as a perfectly new creation. The greatest imaginative genius would strive in vain to picture a wholly new color. Again, the processes of separation and combination are themselves conditioned and limited. When two things have been con-

joined in our experience it is impossible to picture them apart. One's ability to imagine is limited also by the actual sensations of the moment; he cannot look at a blue sky and *at the same moment* imagine it is red. When lying down one finds it difficult and even painful to imagine himself running.

Eidetic Imagery—"Seeing Things."—One is an eidetist in first degree when he has the power to imaginably revive experiences vividly and accurately, but usually the eidetic faculty is beyond the control of its possessor, so that images return arbitrarily. Such images may be the cause of obsessions and terrors and may involve not only the visual sense but the senses of hearing and touch.

Improvement of Imagination.—The child is so subject to false perceptions that he has difficulty in distinguishing between the creations of his imagination and the realities of his environment. These false perceptions (illusions) give rise to wrong mental images and it is one of the functions of the school to destroy such illusions as may be unprofitable in the long run and to build up such a world of realities that the child will be able to adequately adapt himself to his environment. This necessitates the redirection of mental imagery in order that memory, so important in learning, may be utilized to the full.

The major task is to lead the child to distinguish between one type of experience and another. Since we can be sure of but two kinds of imagery, this must be done either through the use of vision or through the use of hearing. To show how the child builds a visual mental image without direction, let us use an illustration,

Use of Visual Imagery.—The child, for the first time, sees an airplane in the distant sky. He looks at it in curiosity. It is too far away to be distinct in outline or for him to hear the hum of its motor. The visual sensation is given a meaning. "A big bird," he says to himself, drawing from his past experience, and a mental image is formed.

This mental image, built upon false perception, would remain forever unchanged if the child should never see an airplane at closer range or should it never be described to him in terms of reality. However, he sees another, this time on the ground and a man climbing out of it. The mental image is changed; now it is an "automobile that flies in the air." In reaching this conclusion he has drawn a second time from his past experience, and visual imagery will take him no nearer the truth.

Use of Auditory Imagery.—The same child is finally taken to an airport where he is not only encouraged to observe all the details of the airplane but is allowed to listen to the hum of its motor while its operation is explained to him. Listening to the motor and to the explanation of how it works, he substitutes a new mental image for the old and comes as near a knowledge of reality as his limited experience and therefore his limited comprehension will permit.

The Teaching Problem.—The problem of starting the child toward right goals is thus the problem of giving him complete and proper mental images. We referred to this in connection with the building of percepts and in connection with the building of habits. Building of the percept or causing the child to enter wholeheartedly into an activity are good in themselves but here the teacher must *stimulate the*

mental image in such way that the child's imagination will not only become productive but creative as well.

The easiest approach to this task is through the use of stories. We have pointed out how the story may be used to recapture attention, but it does more than that. It stimulates the child's imagination because it satisfies his interest, supplements his interpretations, and suggests aspirations. When the child substitutes himself for the hero of the story, his experience is widened vicariously, and he is led to see himself in a variety of situations. J

Means for Presenting the Story.—The various means for presenting the story govern the nature of sensations aroused. The story may be told or read to the child, he may read it silently or orally, or he even may read it silently while somebody else is reading it orally. In these various ways of receiving it, he is building mental images through visual and auditory sensations. Again, the book may contain pictures and these may serve to stimulate. This is well, as may be said of all visual aids when used appropriately; yet the final step, without which the desirable mental image is incomplete, is the teacher's artful application of all that the child sees and hears.

Making the Application.—In making the application, lines first are drawn between the world of imagination and the world of realities; then the relationship between the two is clearly shown. For example, the teacher, knowing that a certain child has been given a dollar, asks him what he would do if he had a thousand dollars. He answers by enumerating the various excellent but imaginary uses to which the money would be put. "But," she reminds him, "you actually have

a dollar. How can you do the most good with that?" Thus does the teacher *use the real to build new mental images, to avoid suppression of the imagination, and to reduce the child's natural planes of phantasy to levels of production.*

Natural Uses of Imagination.—All normal children have two natural ways for using their powers of imagination. They indulge in day dreams, basing these in fancy or in memories of past experience, and they resort to wishing for things toward which habit building has not been directed.

When indulged in occasionally neither of these uses of the imagination is harmful; in fact, each may be beneficial. The humor day dream, for instance, has its benefits. In a moment of relaxation one imagines how funny it would be if such and such a thing were to happen and suddenly breaks into a laugh. Laughter is always personally beneficial even though not always socially profitable.

The day dream in which the child pictures himself as either a conquering hero or a martyred hero has its advantages, chief of which is that it may lead to real heroic acts at a later time.

In like manner wishing may result in good. In fact, in starting a habit in a child, wishing is the very foundation. We do everything we can to create a desire on his part to develop the habit. If we can get him to wish to be a good student, we are in a fair way to help him become one.

The danger in each of these natural uses of imagination lies along two lines. First, the child may dream of or wish for things which could be of no real benefit to him; and second, he may form habits of day dreaming and wishing that are sure to interfere with any effort we may make to get him down to realities. Habits of day dreaming and wishing may lead to lying and subterfuge.

Types of Lying.—There are nine different types of lying recognized by psychologists, represented by nine different kinds of lies. The kinds of lies are as follows: playful or pretending lies; lies of confusion; lies of vanity; lies of revenge; lies of protection; lies of loyalty; lies of deception; lies of wish fulfillment; and pathological lies. Of these, the first seven present problems of common occurrence in the classroom and will be discussed briefly here.

1. *The lie of pretense.* This is really not a lie but a “make believe” game from which the child gets much fun. Here the teacher should *encourage imagination and guard against phantasy by the dramatization of fairy tales.*

2. *The lie of confusion.* This is due to a misunderstanding of the difference between the real and unreal. The remedy here is to *clear up the misunderstanding and not penalize the child for falsehood.*

3. *The lie of vanity.* This is a statement of exaggeration, ranging from bragging to sensation-seeking, and is intended to attract attention. To meet it, *provide legitimate means for attracting attention, such as games and manual activities, but prevent habits of sensation-seeking by occasionally prescribing tasks or feats the child cannot perform.*

4. *The lie of revenge.* This usually results from wounded feelings. Here simply *persuade the child to admit the lie and its cause* and there usually will be no need for further treatment.

5. *The lie of protection.* Fearing that he will be ridiculed or punished, the child lies to protect himself. *Give him some tangible evidence that he is trusted, put him to work at tasks at which he will succeed, and get him to accept responsibilities that will give him confidence.*

6. *The lie of loyalty.* This lie is told for the protection

of one's close friends or family and is difficult to eradicate. The only sure remedy is to *widen the horizon of loyalty; get the child to think in terms of school loyalty first*. If this can be done his friends will be left to devise ways and means for covering up their own wrong actions.

7. *The lie of deception*. This is a lie of vanity, revenge, protection, and loyalty rolled into one. It represents a habit of lying and, being habitual, it must be substituted for. *Show the child that in the long run truthful statements are actually the more profitable*. Because of the difficulty in getting the child to set remote goals this is a slow process, but teachers are aided in it by gradually changing environment and by maturing judgment on the part of the child.

Explanation of Dream Causes.—Dreams in sleep, whether or not we accept Freud's view that they are wish-fulfillments, certainly occupy an important place in the child's emotional development and teachers should *take opportunity to explain the causes for dreams and point out their elements of unreality*. There is still much superstition about dreams and many fears are engendered by them. A simple explanation of dream causes will sometimes completely change a child's attitude toward life and learning.

Directed Uses of the Imagination.—For the normal child the imagination has its best outlet through sympathetic uses. *Teach him to imagine himself in the place of others, to understand their problems, and to see their reactions in the light of their problems*. In learning to do these things he will have learned the first great lesson in coöperative living and in toleration.

For the exceptional child, the child whose imagination takes a creative turn, there are two important ways in which

his imagery may serve. First, *guide it into intellectual channels where the logical ideas it builds may lead eventually into invention or diplomacy*; or second, *direct it into artistic channels where its remote ideals may result in creation of harmony, unity, beauty, and pleasure.* *At*

THE NATURE OF MEMORY

The nervous processes involved in memory are the same as those involved in habit. To the behaviorist, memory is but a general term used to express the fact that, after a period of no practice in certain habits, the function is not lost but is retained as a part of the individual's organization, although it may, through disuse, have suffered greater or less impairment.

The nerve centers have the power to store up and use the effects of their activity, thus making it possible for one to represent (present again), through the process of imaging, the object of perception or thought. This is the revival image which, in the narrow use of the term, is memory. It includes not only retention of past experience but a recall of that experience, a recognition that it belongs to the past, and a recollection of the facts of the experience.

Memory as Retention.—In the narrow use of the term *memory* the original activity of the nervous system persists but for a short time, usually about as long as the external stimulus, then dies out gradually. An illustration of this is the after-sensation or "after-image." If, in the dark, one suddenly turns on an electric light and as suddenly turns it off, he may still see the glow of the filaments, although the light has not been on long enough to produce an actual after-glow. The retina has responded slowly to the stimulation

and the latter persists for a fraction of a second with decreasing intensity.

Likewise the cells of the central cortex "photograph" images. If one looks at a picture for an instant then looks away, the objects in the picture remain in consciousness for two or three seconds. This is not the after-sensation, for the after-sensation dies out when the eyes are moved. It is the persistence of the stimulation of the cortical neurones. The activity dies out gradually or is transferred into latent dispositions to activity in the nervous system.

Recall as a Memory Factor.—Recall is a factor in both imagination and memory. In imagination it is more vivid. After an interval of time one is able to imagine (reproduce an image of) the object he has perceived. He may also remember it but his memory of it is sure to be dim, hazy, and indefinite. In memory recall simply signifies that *some* of the elements of the sense-experience have been retained. If memory is especially dim there has been but partial recall, this being dependent upon the amount of interest and attention aroused by the object.

The recall process induces changes in the synapses of certain parts of the nervous system. These changes persist indefinitely and may be re-aroused for a long time after the original sense-experience. When one sees an object for the first time the sense impression upon the optic nerve is carried to the posterior portion of the cortex from where it passes through neurones to the frontal area. The response is usually an exclamation, such as "How interesting!" or "How peculiar!" If, each time the object is seen, the response is repeated it becomes a habit. As the gestalt psychologists put it, the organism becomes disposed to behave again in the same manner and to *revive* the phenomena which

accompanied the behavior, making the chief function of memory that of developing fixed ways of looking at things.

In recall neither the original stimulus nor the response need be repeated. Some other stimulus, connected with the neurones active at the time, may substitute for the original, and we have become so accustomed to the picture or image that a response is no longer evoked. The process here is this: other neurones, aroused by the first, are stimulated and the synapses between them and other neurones (excited at the same time) become more readily crossed. Thus is the whole neural complex reinstated, with recall of the original picture or image as the result.

Recognition as a Memory Factor.—In most instances recall implies recognition—a familiarity with the object. One sees at once that the object is a part of his past experience. However, this is not always the case. One may recall without recognizing what he recalls. For instance, in writing letters, occasionally a word will fit itself into a sentence, yet the writer will be conscious that he does not remember having used the word before or even having learned how to spell it. He may have read it, heard it used, or have used it before; still he does not recognize it as a part of his vocabulary. On the other hand, he may recognize a word he has been unable to recall. In the same way he may recognize the faces of other persons whom he cannot recall as having seen before.

Recollection as a Memory Factor.—Recall and recognition having taken place, recollection completes the process of memory. One may recollect, *i.e.*, re-collect, parts of the facts of sense-experience or most of them. He images the experience in its natural setting and habit determines the de-

gree of recollection. If, for instance, it has become a habit not to remember the names of people one meets, one is hampered in recollecting where and under what circumstances he has encountered most of them.

Memory as a Selective Agency.—It is fortunate that we do not remember, do not recall vividly, do not recollect totally, all the experiences we have. If we did we would be forced to attach a like importance to each of them and this would make intelligent behavior impossible. Memory selects, or tends to select, those elements of experience important to our conscious purposes, dropping out all the unessentials.

• **The Rate of Forgetting.**—The rate at which unessentials are dropped out has been the subject for extensive experimentation from which is derived this law: the rate of forgetting is greater the nearer one is to the experience. In general, forgetting is relatively rapid over the first three days and becomes slower as time goes on. In illustration: a student, trying to master an assignment which to him has little meaning, forgets most of the material learned in the first few hours. That which remains for a time fades at a much slower rate.

Retention and Rate of Learning.—It is a popular belief that those who learn slowly also forget slowly but experimentation does not support this theory. On the whole, quick learners retain what they learn better than slow learners, whether measured by the time required for relearning or by the proportion of material that can be given without repetition.

The one possible advantage for slow learning lies in the

time taken for assimilation and interpretation of ideas as opposed to mere learning. That is, the slow learner is able to remember more of a passage of poetry or prose after a lapse of a few days than immediately after learning.

Observation and Report.—In observing situations and reporting upon them from memory the commonest inadequacies are errors of omission while the most prominent inadequacy in description is incompleteness or simplification. Correct recall of one feature does not guarantee correct recall of other features and, when one person communicates information to another, not only is there likely to be falsification by erroneous insertion, by substitution, and by transposition in time, order, and space arrangement of items, but there is a certain amount of inadequacy from the very process of communication.

In reporting the details of a situation the average person will score about twenty-five per cent in inaccuracy and the highly trained observer will at times be absolutely wrong in statements to which he attaches the highest degree of certainty.

Elements Affecting Memory.—If one cannot remember he cannot learn, but whether or not his recollection is vivid depends very much upon meaning. A confusion in meaning, therefore, is one of the elements affecting memory. It is sure to produce a confusion in remembering so that one may remember something which either did not happen or was vastly different from his remembrance of it; or he may confuse two similar experiences; or he may supply details which complete the picture but were not a part of the original.

Another element affecting memory is confusion by substitution. A common experience is to be credited with a

"bright saying" which one cannot be sure is original with him; in fact, he may know that he was not the first to say it or that he did not say it at all; yet, in remembering some felicitation the saying has provoked, it finally appears in memory as having originated with him.

Age is also an element affecting memory. Children remember less and are less accurate in recalling details than are adults. This is attributable to the passive attention of childhood and to lack of practice in observing complete situations. In old age there is a noticeable decline in the power to recall details, due to a gradual loss of visual imagery with age.

Association in Memory.—We have seen that if the experience one has is to be remembered it must first make an impression on his nervous system. The impression makes retention possible. Yet retention is ineffective unless one has the power of recall, and he gets this power through association. The experience is retained by the subconscious mind. Before it may be recalled it must be associated with some active element in consciousness, and the ease with which this association takes place depends not only upon the general plasticity of the nervous system but also upon the readiness of synaptic connections in the neurones themselves. When two neurones or neurone groups are active at the same time the connection established between them at the synapses is of such a character that, whenever one of the two is excited again, there is a tendency for the second to be aroused also, no matter how far removed from each other the two parts of the cortex may be.

Laws of Association.—If one has two experiences close together and recalls the first, he is likely to recall the second.

Experiences which are similar may recall one another, as may those which contrast with each other.

Experiences which come first in a series of related experiences are likely to be recalled first, while those which come last are more likely to be recalled than intermediate experiences. Then, too, the more often experiences occur together the more likely they are to be recalled together, and the more vivid or intense the experience the more likely it is to be recalled.

These are the laws of association and they conform to the individual's trend in thinking, so that ordinarily he associates those experiences which, through habit, attention, and interest, he looks upon as having immediate value in his own progress.

Free Association.—Free association occurs in an idle mood when one thought calls up another with no object in view and only fleeting desires to guide the direction of thinking. A student, standing idly on the campus waiting for classes to pass, sees a face that reminds him of his brother at home. He wonders whether his brother is in school and this reminds him of his father's belief in the efficacy of education, which, in turn, makes him think of the costs, which, in turn, makes him wonder whether a check has arrived from home. He is still making these free associations when the warning bell rings.

The free association test, used extensively by the psychoanalysts, presents a subject with a set of words to each of which he is instructed to give as quickly as possible the first word or first association which occurs to him. The list of words below represents a shortened form of such a test. The subject's immediate reply is recorded on the dotted line directly opposite the key or critical word:

sing	
sick	
marriage	
pray	
snake	
money	
nerve	
letter	

Such a test is designed to detect extreme timidity, useless fears, embarrassment, anxieties and worries centered around emotional episodes in the subject's life. Their inadequacy lies in the fact that one may not recall concrete facts from past experience but simply may recall words which have become linked. However, the tests throw some light on individual habits of attention and, if a large number of stimulus words is used, are valuable in providing hints for further study of the subject's mind by showing the intensity of emotional complexes.

Controlled Association.—Controlled association is also illustrated by the use of stimulus words, but this time the subject is required to respond to each stimulus word by a word which bears some specified relation to it—its synonym, its antonym, the use of the word or the use of the object the word names. The teacher uses controlled association when she asks a child to quickly indicate the name of the capital of each country on a specified list.

Simultaneous Association.—If an association is made immediately it is called a simultaneous association. Hearing a familiar footstep or the sound of a familiar voice produces at once the image of the person to whom it belongs.

Successive Association.—If an association is delayed, *i.e.*, if there is a lapse of time between it and the original experience, it is called a successive association. A man whom you do not remember calls you by name. At first you have no idea where or when you may have met him. Later you recall the sound of his voice. Still later you “see” him walking the deck of an ocean liner. Finally the association is complete—you remember the man as a fellow passenger on your first trip to Europe.

Building the Revival Image.—The child's power to retain his mental images is inborn and the teacher can do nothing to change it. The amount of his retention, however, depends upon the strength of his impressions. The revival image (the reproduced mental image after a lapse of time) is, therefore, brought into exercise by a number of factors—stimuli, sense-perception, attention and interest, feeling and emotion, and the nature of the mental image itself.

Revival of the Image without Direction.—The revival image, or memory, is built not only through the power of retention but through the related elements of recall, recognition, and recollection. Let us illustrate this.

During the summer vacation a child has seen a freshly groomed circus zebra standing in the bright sunshine. In school, through incidental instruction, he has been reminded of this experience, and he is able to reproduce an image of the animal as he perceived it, by the use of his powers of imagination. In memory, however, because his interest and attention were instinctive and passive, he is capable of but partial recall, *i.e.*, his memory is dim and he has retained but a few of the elements of the sense-experience.

In recalling the zebra, the child recognizes it as a part of

his past experience. It has made sufficient impression upon him to give him a feeling of familiarity with it.

Also he recollects the experience and the image set up by the animal, *i.e.*, he re-collects all the details of which he is capable by trying to image the zebra in its natural setting. Habit interferes here, however, because most of his impressions have not demanded vivid reproduction.

In telling the other children about the zebra he finds it necessary to draw upon his imagination and, in his way, he is able to describe the animal minutely, filling in details which were not a part of the original experience.

This use of the imagination in aiding memory is often interpreted as intentional falsification, but most often it is but a revelation of what the child sees in his own mind.

Use of Association.—In the above example it is to be noted that the child has been *reminded* of his experience. In fact, he could not have recalled the experience in any of its phases unless it first had been associated with some active element in his consciousness. It was revived through mention of a zebra or by a picture of one. Recall would have been facilitated if the two experiences had happened close together, or the first had been especially vivid, or had he seen the same zebra frequently.

Again, he could have reproduced the image in greater detail and with greater accuracy had there been connected with the original experience some great emotion, such as great joy in seeing the animal or great fear because it had kicked at him or had tried to bite him.

Hindrances to Recall.—While *fear* may function in causing a first impression to be longer retained, it sometimes interferes with recall. The child does not remember his

lines nor the public speaker his speech when seized with stage fright. Fear, in the form of anxious self-consciousness, makes recall difficult and improbable if not impossible.

Distractions, such as two or more responses arising to the same stimulus, often prevent recall. For example, a teacher who had difficulty in remembering the first names of her pupils could not recall whether the name of one boy was Ben or Dan. When almost sure the one name was correct the other would insistently crowd out the first. She was certain the name was composed of but three letters. Perhaps after all it was not Ben or Dan, but Ban. She called him Ban. His embarrassment was only exceeded by hers. His name was Ned.

Another type of distraction is that which frequently arises at examination time. A student will think one thing and write another. A word or phrase in the examination question will stimulate a response that has little or no connection with the correct answer but the interference is so strong that accurate recall is indefinitely delayed. Add to this the emotional state of some students at examination time and we get such answers as: "Columbus was discovered in Ohio" and "The Colonists seized Lipton's yacht and threw the tea overboard." One student, with a strong sense of humor, after having failed to recall any of his facts accurately, is reported to have written at the bottom of his paper: "Professor, if you succeed in selling these answers to a comic magazine, we'll split fifty-fifty."

A strong *sense of humor* itself often will interfere with accurate recall. Where the serious response is expected, the student, seeing fun in everything, is unable to shake off that tendency long enough to make a serious reply.

↳ *Logical associations* sometimes lead to interference. For example, a British boy, after hearing a discussion of a pro-

posal to make popular substitution of the word "tide" for the word "mass," such as changing the word Christmas to Christtide, remembered the speaker's name (Thomas Massey) as Totide Tidy.

An unusual interference with recall is a habit known as *synaesthesia*. Some persons, perhaps five to ten per cent of any group, invariably project numbers upon forms, a habit which may be maintained throughout life. Others have colored hearing; when they hear or remember a tone, the tone seems to have color. The explanation is to be found in the fact that such persons tend to give fulness to perceptions and images. In recall, where the effects of this fulness is lacking, there is inaccuracy.

Improvement of Memory.—Scashore states that every normal person is born with a brain capacity for memory far beyond what is ever developed and that any normal child may increase his memory by proper training at least tenfold, often much more, and still not utilize his capacity to the limit.

Such improvement in the use of a given brain capacity, however, says Scashore, is no evidence of improving the capacity. It is nothing but evidence of acquired ability to use the available instrument or capacity. This means that, although no improvement may be expected in retention and very little in recognition, the power to recall may be greatly strengthened. What then are some of the aids to recall.

Aids to Recall.—As guides to general practice in aiding recall we have the following three short rules, two of which have been presented in other forms but are repeated here for emphasis:

1. *Avoid confusion in meanings.*
2. *Point out distinctions between those things actually recalled and those arising from imagination.*
3. *With the rate of forgetting as a guide, select and emphasize those things which may profitably be remembered.*

For the child who is having immediate difficulty in recall there are three more aids:

1. *Dispel all doubt about his ability to recall.* If he insists that he cannot remember there is interference from the start. He should be encouraged to call up associations that will facilitate recall.
2. *Cause the child to avoid worry and self-consciousness and trust to his ideas to serve him in recalling words or numbers when needed.* Get him to forget his audience and plunge into the thing he wants to say.
3. *If, after trying hard, the child cannot remember, let the matter drop for a while and go on to something else.* The mind freed from interference is reasonably sure to produce the right associations.

Mnemonic Systems.—The question often arises: cannot one improve his memory through the use of some mnemonic system? The answer is: although one is frequently helped in remembering disconnected facts, the general power of memory is not the least improved.

In remembering disconnected facts one may resort to simple mnemonic devices. For instance, if one desires to remember the name Wolfe, he may recall it by associating it with the animal *wolf*, provided he does not recall the fox or the bear; or a telephone number, such as 1313, may be fixed in the mind as *do-mi, do-mi*, the first and third notes on the musical scale.

Failure to attach sufficient importance to the thing to be remembered often interferes with the operation of simple devices. For example, an instructor in a night school, who offered a course in memory training, complained that one of his students got away without payment of fees. When asked why he did not bring him to time he confessed he could not remember his name.

Nothing is to be gained by the teacher in the use of extensive mnemonic devices. Artificial memory systems are only to be recommended for the first land-marks or for such purely detached facts as have no rational connection with the rest of one's ideas. Drill in memorization is good when employed with one system of objects but it does not carry over. For instance, drill in memorizing poetry will help one in memorizing other poetry but it does not transfer a power to memorize historical facts.

Children are usually good at remembering facts connected with their own special activities. By centering the memory upon some special activity a child may eventually become a genius along a single line. Pillsbury, the chess player, is an example. Blindfolded, he played simultaneously fourteen games of chess, two games of whist, two games of checkers, and carried on a running conversation, usually winning the games. Spectators spoke of his exceptional memory, yet he had but an ordinary memory along other lines. He had developed a special skill through excessive concentration and exceptional patience.

Changing Behavior through Memory.—In its wider usage, memory means the retention of an experience in such degree that it influences behavior. It is of no particular value to the school child to be able to recall an experience unless, in recalling it, he sees in it elements that will bear consistent

repetition or sees its relative uselessness and drops it out of his scheme of things. His behavior must be changed in some way.

We have intimated that emotional states facilitate recall of experiences, but the teacher's emphasis should not be placed upon the development of the emotions (they will develop of their own accord). She should *attempt to develop a logical memory in the child*. Logical memory is the recognition of meaningful facts and the ability to recall them in logical order. There is a high correlation between the child's logical memory and his general intelligence, and the child who develops an excellent logical memory will have little difficulty in mastering his school work, *if* he is interested and willing.

Testing for Recall.—Numerous methods for testing memory have been employed in the psychological laboratory but most of them are too elaborate for use by the classroom teacher. However, one of the simpler ones may be employed.

The test may be given in the form of a game. Arranging the group in a circle, with individuals far enough apart that a whispered conversation cannot be heard, the teacher announces that she desires to send a message around the circle. She begins by whispering the message to the first child on her right who runs to the next child and whispers the message. Each child carries the message in his turn and the last child to receive it delivers it back to the teacher in tones loud enough to be heard by everybody. Beginning with a simple message, such as the command to run, messages may be increased in difficulty until errors in transmission appear. The latter may be traced to the child first making them.

The results of this test bear out a statement made earlier that: when one person communicates information to another

a certain amount of inadequacy results from the very process of communication.

Other simple tests of memory may be worked out by the teacher by consulting any good book on experiments in psychology.

Memory and Cramming.—Cramming for recitation or examination is sometimes justifiable, especially when many facts are needed for immediate use but which may be dropped from memory when they have served their purpose. However, permitting the school child to form the habit of cramming should be avoided, since most of the facts learned in that manner are forgotten at once.

To avoid cramming by the child, the teaching of facts should be limited to those the teacher believes should be remembered. In other words, little relative importance should be attached to those facts which may profitably be forgotten.

Procedure for Developing Use of Memory.—Better uses of memory may be attained by employing the following steps:

1. *Use subject-matters made interesting through association with materials in which an interest already exists, and treat these subject-matters in a variety of ways so that fluctuating attention may be focalized anew.*
2. *Develop in the child the habit of memorizing subject-matters which have a meaning to him, or through which he may derive meanings that will affect his behavior.*
3. *Emphasize the development of logical memory by connecting with facts, in their logical order, associations which will arouse and sustain interest.*

QUESTIONS AND PROBLEMS

1. Describe by illustration the two types of images growing out of perceptual experience.
2. Differentiate between imagination and illusion.
3. Of the five imagination types given by Seashore which are the most important and why?
4. What is the difference between free imagination and controlled imagination?
5. Show the relationship between imagination and day dreams.
6. What are the three chief causes for dreams as given by Macnish?
7. How does emotion affect imagination?
8. What is eidetic imagery?
9. Give an original example to show how the child builds a visual mental image without direction.
10. Add to this illustration by showing the use of auditory sensation.
11. Distinguish between productive and creative imagination.
12. As a teacher, how would you use the story to build the mental image?
13. What are the child's natural uses of imagination? Give examples.
14. Define briefly seven different types of lying indulged in by children. Which type is the most harmful?
15. Why is it well to explain to children the causes for dreams?
16. To what uses may imagination best be put?
17. Give original illustrations of retention in memory by using after-sensations and images in consciousness.
18. Differentiate between recall, recognition, and recollection.
19. Just how does memory function in intelligent behavior?
20. What has been found out by experiment concerning the rate of forgetting?
21. Which has the advantage in the long run—the fast learner or the slow learner?

22. In reporting upon facts or situations observed, what are the chief limitations of memory?

23. What are the elements which interfere with the clear functioning of memory?

24. State in your own words the laws of association in memory.

25. Show the difference between free association and controlled association.

26. Give original examples to illustrate simultaneous and successive associations.

27. Take a situation from the teaching of geography and show the possible uses of recall, recognition, and recollection.

28. What are five important hindrances to recall?

29. What three general laws would you follow in trying to aid recall?

30. What are three good ways for helping the child who is having immediate difficulty in recalling facts?

31. What is logical memory and how can it be improved?

32. What is the advantage and disadvantage in cramming for examinations?

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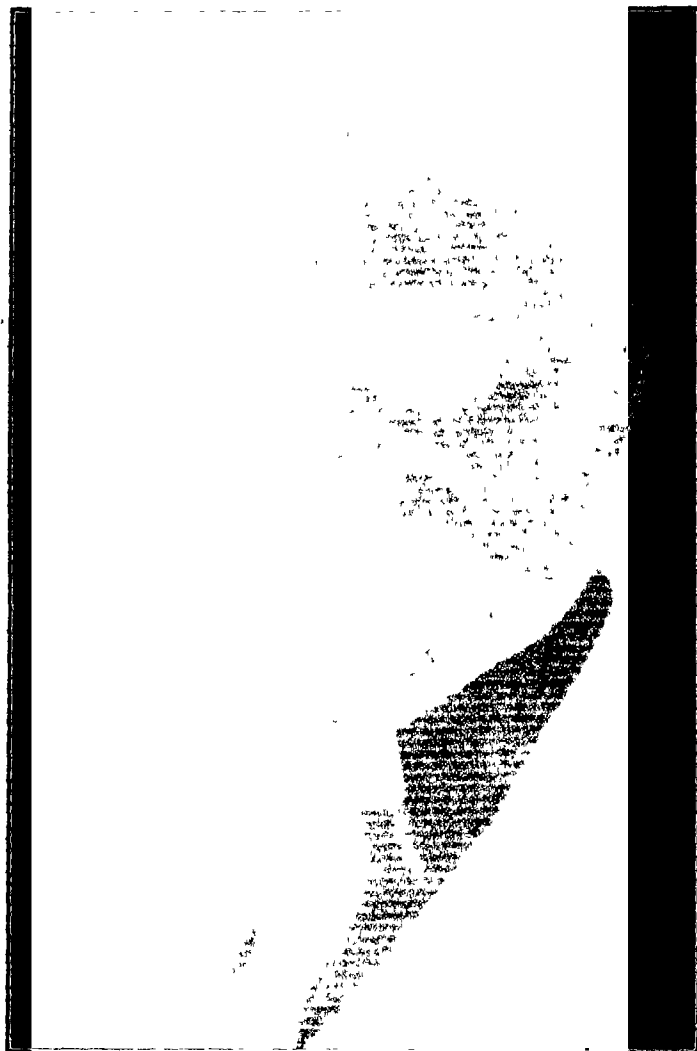
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CHAPTER VII

Language as Expression

Up to this point our discussion has been confined to mechanical modes of behavior and conscious states. Language is neither a mechanical mode of behavior nor a conscious state; it is what we may term an inevitable accompaniment of the conscious states, and therefore calls for separate treatment. It is the purpose of this chapter to show how language is connected with instinct and habit and with the various conscious states discussed, how the child acquires a language and how we help him in the process.

THE PSYCHOLOGY OF LANGUAGE

When the child comes into the world he has the instinctive equipment for acquiring habits of speech. He has, as Wundt has put it, psychical and physical traits favorable to a reception of language. The question is then: when and how does language begin?

Language in Instinctive Behavior.—Long before he actually begins to talk the infant makes many noises—noises which the prejudiced parent often interprets as conscious efforts to communicate with others. It is true that nature provides him with means for making the wants of the bodily organs known; he cries when he is hungry or when uncomfortable from external or internal conditions; he coos and babbles when these wants are satisfied—a feeling-tone resulting from organic processes.

These reactions, however, are but spontaneous expressions which help make up the background of consciousness. They result from excitement of the nervous system by internal and external stimuli, or from the abatement of these. They are unlearned responses.

Provisions for Speech.—Speech, a learned response, is fundamentally dependent upon two sets of muscles—those which make provision for breathing and those which control the vocal cords.

The muscles which make provision for breathing supply the body with oxygen for the maintenance of life, while, at the same time, they make speech sounds possible. Thus speech is dependent upon respiration—the learned upon the unlearned—and anything which affects breathing, such as a head cold, for example, is sure to affect speech in some manner—in rate, articulation, or distinctness.

The vocal cords are located in the windpipe and are sheathed by tissues which line its inner wall. Cartilages, capable of moving on one another, hold the vocal cords in position and make it possible for them to vary in tension. When one speaks the tenseness of the cords determines the pitch of the sound and the rate of air movements, the latter producing the sound vibrations which, in turn, are modified in the resonance chambers of the mouth and nasal cavity. Finally the tonal quality and intensity of the sound are further modified by the tongue, the teeth, and the lips. Failure of any of these organs to coöperate limits articulation.

The Infant and Speech.—Although the power to emit sounds is with the infant at birth, the power to control those sounds is something which must be developed through prac-

tice. The unmodulated wails and laughter of the infant indicate that this power has not yet been acquired.

The earlier sounds are accompanied from the first by random, if not appropriate, movements of parts of the body not directly involved in the production of sound. The infant waves his arms and kicks his legs freely. Later these muscular movements are modified and appear as kinaesthetic accompaniments to the interpretation of word sounds.

The infant eventually begins to utter sounds that foretell his ability to use words. He says *ma ma* and *da da*, not at first because he has given these sounds meaning but because they are the inevitable responses to the inner drive toward activity. Seizing upon these as "baby's first words," the prejudiced parent encourages their repetition. This is well, for the encouragement of such sounds until they become a part of the language is the best way for beginning the child's lessons in speech.

Tanner points out that the child, in building its first concepts, uses words in altogether too wide a sense. "Mamá," "bath," and "wow-wow," she says, are applied not only to the particular objects he knows but to all that in any degree resemble them. He associates the word with the whole situation in which it is used; thus, "quack" stands not only for ducks on the water but for all birds, insects, and even liquids. He is trying to classify them and must use what he already has in the way of words to aid him.

Language in Habitual Behavior.—Quick to imitate facial and gesticulative expressions, the young child continues to imitate those in which he finds pleasure. This soon builds up habits of imitation, called *echolalia*, in which the child repeats with tireless continuation all the words or sentences he hears, either completely or else their closing cadences. In

illustration: the adult finds that he is able to amuse the child by a cry of *boo!* The child immediately learns that this speech sound is intended as fun and answers in kind; but he does not stop there; he continues to *boo!* until the patience of the adult is exhausted.

As the child grows older he learns a greater variety of speech sounds and learns, at the same time, that these are means of social communication. Presently, through imitation, he has acquired short, articulated sentences, and habits of imitation have led into habits of speech.

Habits of speech become rather firmly fixed. The child uses the same expressions and makes the same grammatical errors as those about him. In his first imitations the words need not have meaning to him. Later he acquires their meaning and vocabulary building has become a conscious process.

Implicit Language Habits.—The child uses many words, says Watson, which belong to the conditioned reflex level of word activity rather than to the highly integrated and associated level of the adult, and, at what point he makes the transition from overt to whispered and then to implicit language, it is difficult to say. Perhaps all three forms go on together from the start. Children are talkative because at an early age their environment does not force a rapid shift from explicit to implicit language; they are really thinking aloud.

Even in the adult the shift is not complete, as is clear from observing individuals while they are reading and thinking. Many persons, when reading, move the lips along with the eyes, and many, while thinking, speak aloud. The behaviorist's view, says Watson, is that overt language develops under social training; the individual learns to talk with others and must continue to talk when alone, when reading, or when

thinking; he never completely makes the transition to implicit language habits.

There are many persons, however, who read aloud or speak aloud to shut out distractions. Others use the same means to aid memory; by saying aloud what they plan to do during the day, for instance, they are able to remember their duties in logical order.

Language in Conscious Behavior.—No sharp line is to be drawn between habit formation and the development of consciousness. While one is forming habits he is also experiencing a development of the conscious states and processes. If this were not true, acquisition of a language would be impossible, and, without language, one could not articulate his ideas. Language is therefore not only the outcome of proper connections of speech sounds; it is the forerunner of ideational processes.

Language in Sense-Perception.—When the child reaches a point in his development where a stimulating object causes a meaning to be registered in his consciousness, he has a name for that object, even though not openly expressed. The name, when openly expressed, may not fit, but this does not mean that the word or words employed are the result of spontaneous processes. They have been acquired. If they are in error, either in form or application, this has been due to improper acquisition, and this, in turn, is not meant to imply that the child does not learn words entirely divorced from the act of perception; in fact, we have already shown that he does, through imitation. When he supplies a word or term which serves the purpose of showing the meaning he gives to sensation, he not only is using perception to help build a vocabulary; he is beginning to acquire a language.

Language in Attention and Interest.—Language, like attention, is rhythmical in character. In fact, in the acts of acquiring a language, the child is influenced and controlled by the rhythmic character of attention and this helps to provide his language with rhythm. This results eventually in the production of rhythmical poetry and prose and makes possible the appreciation of these by persons who have attended to the learning of language through conscious effort.

Because, throughout the early days of childhood, the child attends without effort to those things which interest him, he builds a limited vocabulary, with the limitation that the articulated speech sounds he learns must have for him an immediate value—must be utilitarian either in satisfying wants or as a natural accompaniment to the tendencies to play. Later he becomes interested in the acquisition of language as a means for social advancement or as a means for fostering appreciation. However, whether through attention or through interest, the efficacy of his language learning is dependent upon the amount of satisfaction derived.

Language in Feeling and Emotion.—The normal child has a feeling of pleasure at the sight of a moving train. Whether he imitates the engine's puffing or is taught to do so, he prefers *choo-choo* as a term of description for all trains. This is due partly to ease of acquisition but mostly to the satisfaction he gets from making the sound—satisfaction attendant upon both muscular and auditory sensations.

This type of feeling is not limited to the experiences of childhood. As one grows toward maturity he continues to have a feeling about words, even when he does not comprehend their meaning. He has favorite words, some of which

he uses with monotonous repetition. Others he rejects; they either do not feel right to the muscles of speech or do not adequately express the feeling he intends to convey.

Speech is affected by emotional state, particularly if respiration is changed in any way. The child tends to become inarticulate when angry or when over-joyed. This is due to muscular interference in the organs of respiration and therefore in the organs of speech. The sputtering and stuttering which frequently accompany one's strong emotions may be inhibited only when the emotions are brought under control.

Language in Imagination and Memory. —Images are said to be concrete or symbolic according to whether they bring to mind a picture of an object or a symbol of an object. The idea *tree* may present an image of a tree itself, an image of the word *tree*, or one of several words in association, such as:

Poems are made by fools like me,
But only God can make a tree.

This is true of concrete objects which may be represented by symbols (words), but not all words are symbols of objects; abstract words, such as *liberty*, *equality*, *fraternity*, have no concrete counterparts.

The place of imagination in the child's acquisition of language lies first in the elementary experience of imaging concrete objects, and second in using words to give meaning to mental-image concepts on the active-attention and creative levels.

Memory, in language learning, finds its place in the recall, recognition, and recollection of words in their original set-

ting. The fact that the child is able to recall words once learned makes possible the building of a large vocabulary. If, in the full meaning of memory, the child retains words in their full meaning, changes are effected in his behavior when they are recalled.

These changes in his behavior would not come to pass, however, if the words recalled were not associated with active elements in his consciousness. Since trends in his thinking determine the nature of his associations, the language he comes to accept or reject is dependent upon the needs of his thinking. The different stages through which the child passes in his understanding of words are responsible to the complexity of associations he makes in giving the words meaning.

The Child and Written Language.—In the acquisition of written language the child, if he does not give voice to the words he is endeavoring to write, goes through kinaesthetic movements representative of speech. His tongue and his mouth fight to give oral expression to the words he is trying to form with pencil or pen. Later, through habit resulting from drill, he is able to inhibit these sound-making muscular activities and center his energy upon motor coördinations of bodily posture and arm movement.

The steps in training the child to write we shall outline a little later. Here let us simply point out the two aims of training in written language:

- 1.¹ To provide the great social values derived from being able to express one's thought in written form.

2. To stimulate creative writing in order that the individual, through written history and literature, may add to our intellectual life.

LANGUAGE IN DIRECTED LEARNING

Language, we have said, makes possible the articulation of ideas. It does more than that; it helps to lift learning above the level of trial-and-success. For these two reasons it is the most important subject in the school curriculum.

Other school subjects, when their purposes are analyzed, but serve to extend language as a means for communication. Spelling, reading, writing, composition and grammar are but parts of language-study proper, while mathematics, the sciences, and the social studies bring communication into sharp relief, and the arts and physical education give outlet to various types of motor expression.

It is the purpose here, therefore, to discuss the different school subjects *as language*, and we may begin with those which serve the subject of language directly.

Subjects Basic to Communication.—The teaching of proper language habits is always to be considered from four standpoints: (1) helping the child to understand the language when spoken; (2) teaching him to speak the language; (3) helping him to understand written or printed language; and (4) teaching him to write the language. As intimated above, the school subjects primarily involved in working out these processes are spelling, reading, handwriting, composition and grammar.

The Child's Vocabulary.—In the use of language the first eight months of life are generally regarded as a pre-linguistic stage. It is at about nine months that the average child says *da da* or its equivalent, and at ten months it begins a rudimentary imitation of sounds. At twelve months it says two words; at fifteen months, four words; and at eighteen months, five words or more.

Smith reports the average size of vocabularies of children from one to six years of age to be as follows:

<i>Age</i>	<i>No. of Words</i>
One year	2
Two years	300
Three years	875
Four years	1550
Five years	2100
Six years	2600

At the end of the first year, words, through imitation and training, come with great rapidity, as Miss Smith's figures

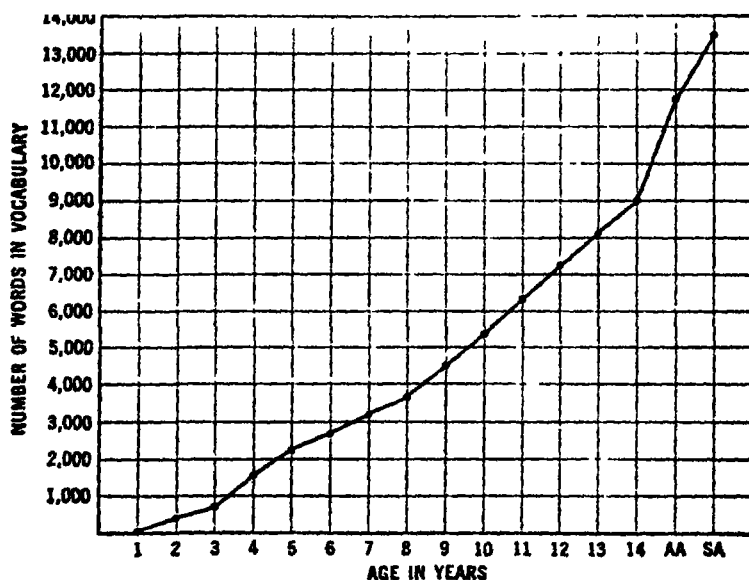


FIG. 10

Curve showing growth of vocabulary from age one to age fourteen, with addition of average vocabulary for average adult and superior adult. The curve is plotted from the figures supplied by Smith and Terman. There is nothing in the curve to indicate the relative difficulty of the words used by Smith and Terman respectively; it shows only the *number* of words understood by children of various ages.

show. The understanding of words always exceeds the child's ability to use them, and the Smith vocabularies are based upon understanding rather than use. The six-year-old child, for instance, can give meaning to about 2,600 words but can use, in oral speech, only about half that number.

Taking his results from individual mental testing Terman reports the average size of vocabularies (words understood at various ages) as follows:

<i>Age</i>	<i>No. of Words</i>
Eight years	3600
Ten years	5400
Twelve years	7200
Fourteen years	9000
Average adult	11700
Superior adult	13500

Spelling in Language Teaching.—When the child enters the directed school one of the teacher's first tasks is to help him add to his vocabulary and it is here that the lessons in spelling are to be begun. In learning to spell, the child's maturity, not his memory, is the chief factor. That is, as the child gets older his acquaintance with words and his practice in using them, together with a native ability for discriminating between them, determine the amount of correct spelling he will do.

When it comes to a question as to what words are to be taught we have the following criteria of selection:

1. Words of most permanent value in writing, in school or outside.
2. Words of most permanent value in reading, in school or outside.

3. Words most frequently used by children in speech.
4. Words which are phonetic.
5. Words which are easiest to spell.

Teachers should insist upon careful spelling in all written work, should not waste time in teaching words that the pupils can spell already, and should require the pupils to use the dictionary. In choosing words to be taught the teacher should be guided by some such list as that provided by Horn—a basic list of 3,000 to 4,000 words for the elementary grades, selected on the basis of the percentage in each grade who have spelled each word correctly.

The rules for teaching the child to spell may be stated as follows:

1. *Write the new word in its normal form on the black-board.*

2. *While writing it pronounce it distinctly.*

3. *Develop the meaning orally either by calling on the pupil for a sentence using the word or by giving a sentence or by defining the word.*

4. *Show the syllables into which the word is divided.*

5. *Do not call attention to the wrong form. For example, never say, "Do not write listen with two s's." Say rather, "Notice the silent t in listen."*

6. *Have the pupils write the word on practice paper several times, spelling quietly as they write.*

7. *Allow the class a moment in which to look at the word again, then close the eyes and try to visualize it.*

8. *Provide plenty of opportunities for drill but do not require the pupils to write a word ten, fifteen, or twenty times mechanically.*

9. *Encourage the spontaneous use of words being taught.*

10. *Use rivalry and motivated exercises to stimulate interest in spelling.*

Reading in Language Teaching.—The normal child can learn to read in the first or second grade. Here a desire for reading and for the possession of books must be created and a reading habit established so that the mechanics of reading may not stand in the way of thought-getting. Later he must be led to get information and enjoyment from the printed page and, to accomplish this, he must be taught to give meaning to words and pronounce them, interpret the meaning of words when they appear in sentences, control his voice for oral reading, and use such mechanical helps as a table of contents, an index, and a dictionary.

From the standpoint of the hygiene of reading, the material used should be printed with the blackest of ink on the whitest of unglazed paper, to provide contrast without reflection. The lines should not exceed four inches in length and the margins should be regular. For the first four grades the size of type and spacing should run as follows:

	<i>Size of Type</i>	<i>Width of Leading</i>
First grade	2.6 mm	4.5 mm
Second grade	2.0 mm	4.0 mm
Third grade	2.0 mm	4.0 mm
Fourth grade	1.8 mm	3.6 mm

For the fifth, sixth, and seventh grades the minimum height of letters should be 1.8 millimeters, with a minimum interlinear space of 2.4 millimeters. Above the seventh grade the minimum height should be 1.7 millimeters, with a minimum interlinear space of 2.2 millimeters.

Rules to apply to the teaching of reading may be stated as follows:

1. *In the early steps use action-words and games on the blackboard, accompanied by familiar rhymes.*

2. *Follow this by having the child read simple books, by the free use of pictures, and by the employment of some system of phonetics, so that habits and skills in reading may be built.*

3. *Stress oral reading in the primary grades but, with the beginning of the fourth grade, earlier if possible, increase the child's comprehension and speed by stressing silent reading and widen his experience by drawing materials from other subjects, such as arithmetic, history, and literature.*

4. *Give plenty of practice in reading, first in following the thought of the writer, then in following the train of the child's own thinking while reading with a purpose.*

5. *Remember that tastes in reading are cultivated, not natural.*

6. *Remember also that there is a vast difference between the recognition of words and the recognition of meanings.*

Handwriting in Language Teaching.—In its earlier stages writing is a hindrance to the child's thought. This is because it is centered in the development of muscular habits which are to result in speed, legibility, and beauty. The child's attention should be directed to the best position of the body, arms, and fingers, while uniformity in size of letters and in slant should be sought, and alignment, form of letters, character of line, and spacing emphasized.

Defects in handwriting are usually listed as follows: too much slant; writing too straight; writing too heavy; writing too light; writing too angular; writing too irregular; and spacing too wide.

While the causes for these various defects may be purely individual, most of them may be avoided or corrected by directing the child in accordance with the following rules:

1. *Support the hand on the fingers.*

2. *Hold the arm at right angles to the line of writing.*
3. *Rest the arm on the muscles of the forearm.*
4. *Grasp the pen loosely.*
5. *Face the desk squarely.*
6. *Keep body erect and both feet on the floor.*

These conditions guarantee the best muscular responses but plenty of opportunities for practice must be provided so that writing may become relatively automatic and the child freed to express his thought.

Appeal must be made to natural action, desire for mastery, and love for beauty, while clarity of line is the important objective. Instead of supplying the child with a finished model the teacher should write the copy on the blackboard, thus bringing out more pronouncedly the tendency to imitate.

Composition and Grammar in Language Teaching.—

When the child has so mastered handwriting that he is able to express his thought, teach him:

1. *To write courteous letters.*
2. *To compose unified and coherent paragraphs on familiar subjects.*
3. *To collect and organize material for oral discourses.*
4. *To present material already organized.*
5. *To read aloud so that the writer's thought and spirit may be caught.*
6. *To correct his errors in grammar.*
7. *To drill in declension and conjugation for future work in other languages.*

Materials appropriate to age and grade should include: games, formal drills, pictures to be interpreted, selections to serve as correct models, selections to be rewritten in correct form, and selections to be used for declamation and interpretation. These materials should be drawn from the pupil's

dramatic, athletic, vocational, and other school interests, and from wholesome magazines and books. If possible, vitalization should be secured through the printing press.

Summary: Language Study Proper.—In the teaching of proper language habits the teacher should keep in mind the high correlation between a large vocabulary and general intelligence. She should teach first for correct word meaning, then for correct sentence meaning. Motor expression should be encouraged and habits of organization built by careful training in handwriting. The child should be required to compose original selections and to read silently and orally with understanding from selections in appropriate books and magazines. Throughout all school training the teacher should be careful to correct the child's grammatical errors, thus ensuring three things: (1) greater ease of expression; (2) greater facility for social adaptation; and (3) more rapid progress in the study of other school subjects.

Subjects Which Facilitate Communication.—Mathematics and the sciences provide, among other things, new problems in vocabulary building, while the social studies widen the fields for communication by giving the child first-hand information about his environment.

Mathematics as Language.—The progression in mathematics is from simple, concrete quantities (arithmetic), to quantity as applied to space relations in general (geometry). In the earlier stages numbers are learned by the use of coins (symbols) and, as the work progresses through the grades, counting is the basis for all the fundamental operations. *The utilitarian aspect of arithmetic should be emphasized and the problem attitude developed, while resort should be made to drill, motivation, and the project.*

It is in algebra that the child must learn an entirely new vocabulary. *Treat the subject as a generalized arithmetic.* It is not concerned with results but with the general laws for securing those results.

In geometry give the child familiarity with geometric forms common to nature, industry, and life and develop space-perception and spatial-imagination through an understanding of space relationships.

Thus not only is a new vocabulary built but the child has added to his means for communication through: ordinary business transactions; the use of symbols as substitutes for words; and a better appreciation of space and time.

Science as Language.—The study of any science should enable the child to apply scientific principles to his daily environment, first to problems of production, then to intelligent use and consumption of products. The facts of science do not limit him to perceptual thinking but require imagination and critical thinking.

The problems may or may not originate with the child but he must be caused to work at them in such way that he will reflect on them and analyze them.

Here again, in hygiene and in the natural and physical sciences, the child will meet a new vocabulary, but the teacher should *attempt to widen his knowledge and experience through observation and develop in him the scientific attitude toward the problems presented by his environment.*

Social Studies as Language.—In the social studies emphasis is to be put upon building habits in methods of attack in solving the problems of the community; this in the light of the child's past experience and in comparing his community with others. A social point of view is to be developed and a will to engage in social service.

1. *Train the child as an active and participating member of society.*
2. *Teach him to identify the major social institutions.*
3. *Lead him to see the necessities, comforts, and conveniences of the present as products not only of the past but of present coöperation, initiative, and service.*
4. *Cause him to acquire a respect for law and a desire to develop ideals.*

Thus will his place in the social scheme be made plain and thus will language be utilized in furthering cooperative enterprises and movements.

Summary: Subjects Facilitating Communication.—In stressing the utilitarian aspects of mathematics the teacher should make clear the need for exact knowledge in ordinary business transactions and should emphasize the value of being able to think in symbols and in terms of space relationships.

In presenting the sciences the teacher should keep in the foreground the search for truth and should stress the need for verification of facts and conditions observed.

The social studies should be used to widen the child's experience, while, at the same time, facts employed in building good habits of citizenship in the local community should be immediately applied. Whatever else is accomplished the child must be caused to acquire a respect for law.

Subjects Which Facilitate Motor Expression. —Closely related to language as a form of expression are the motor activities developed through the practical arts, the fine arts, and physical education.

Practical Arts as Expression.—In learning the practical arts *the child is to gain a limited degree of skill in handling*

domestic, commercial, industrial, or agricultural materials, tools, and machines. Through these, motor activities are called into play and the child is given much-needed opportunities to make muscular response to the various stimuli demanding motor reaction.

The child drawn to the subjects in the practical arts field is usually of the motor-imagination type and responds readily to the kind of instruction imparted; but, where the subjects are offered for exploratory purposes, children of all kinds and degrees of mentality are attracted, and those who remain for further training belong, generally speaking, either to the motor-imagination or creative-imagination types.

Fine Arts as Expression.—Two needs are to be met in teaching the fine arts. The first of these is the need for broad training in appreciation; and the second is the need for the training of those who are possessed of special aptitude and talent.

In music the child should be taught to sing for the joy of singing.

In art the child should be taught to appreciate beauty in color and form.

Each of these subjects has its practical values but each lends itself admirably to emotional expression and therefore serves as a substitute for language.

Physical Education as Expression.—Physical education is largely a matter of health education. The teacher should *teach physical education to stimulate the muscles and train the circulatory system so that the muscles may be kept clear for physical activity (expression).*

In physical education we see, correlated with language, muscular responses which appear in the infant before

language is learned but which, through inhibition and redirection, are made to serve the broader purposes of communication indicated by language.

Summary: Subjects Facilitating Motor Expression.—

In using the practical arts, the fine arts, and physical education for development of skills in motor activities, the teacher should keep in mind that: (1) the practical arts serve as a finding ground for the child's future manual activities; (2) the fine arts are best used to provide outlets for emotional expression; and (3) physical education is to be directed toward building a perfect house for the mind of the child.

Materials for Thinking.—The school subjects we have been discussing provide the materials and facts for thinking. Their psychology has been presented broadly with a purpose—we must see the problems of directed learning as a whole, else we cannot hew to the line in teaching the child to think; and we turn next to the task of showing how the child thinks and how he may be taught to think.

QUESTIONS AND PROBLEMS

1. What are the infant's physiological provisions for speech?
2. Explain how the terms *mama* and *papa* came into our language?
3. Give examples to show how the child uses words in altogether too wide a sense.
4. What is meant by the term *echolalia*? Illustrate.
5. What are implicit language habits?
6. Show why we sometimes talk to ourselves.
7. Do the words a child learns always grow out of perception? Explain.

8. How is the learning of language affected by attention and interest?

9. What are the respective influences of feeling and emotion upon the learning of language?

10. Do you have any pet words or phrases? What are they? Why do you cling to them?

11. What is the place of imagination in building a vocabulary?

12. Likewise, what is the place of memory?

13. What kinaesthetic movements are taking place when you are engaged in writing? Does the subject to which you are writing make any difference?

14. When in the life of the infant does the acquisition of language begin? Why then?

15. Why does the child's understanding of words always exceed his ability to use them?

16. What has the size of the child's vocabulary to do with his general intelligence?

17. Discuss the advisability of inviting attention to wrong forms in spelling and grammar.

18. Trace through the grades the progression of the teaching of reading.

19. What psychological factors are involved in the teaching of handwriting?

20. Summarize the recommendations for the teaching of language-study proper.

21. In what sense may we say that mathematics, the sciences, and the social studies serve to increase the possibilities of communication?

22. What, above all, should result from the teaching of the social studies?

23. Show how the practical and fine arts are related to language-as-expression.

24. With your knowledge of psychology, what would you say are the advantages to the mind if the body is trained in habits of health?

25. Could a child think if he had no means of communication?

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CHAPTER VIII

Teaching to Think

Our learning, as we know, is the indirect and inevitable outcome of instinctive tendencies. Knowledge and information derived from such tendencies may or may not have future value but the habits which grow out of them are indispensable to learning. Particularly is this true of language habits.

On the level of non-language habits we are not far superior to some of the lower animals. In learning capacity the chief thing that differentiates a man from the animals is his ability to make use of language habits, such as talking and writing or the flick of an eyebrow and the turn of a lip.

Our chief advantage over the animals lies in the fact that we are able to think; and it is the purpose of this chapter to show why we think, how we think, and how we may be educated to do a better type of thinking.

THE PSYCHOLOGY OF THINKING

Lost for the first time in a dense forest a man may use any one or all four of the following methods for getting out:

Like an animal in a maze he may fall back on the method of trial-and-success and rush hither and thither until he accidentally hits upon a path or trail that will lead him into the open country.

Or, before frantically trying one seeming egress and another, he may evolve a plan for avoiding error, such as that

of marking the trees through which he travels in order that he will not cover the same ground twice. Here he is using a degree of insight.

Or, before resorting to the method of trial-and-success, he may observe that the forest is less dense in one direction, that animals, possibly domestic animals, have been in the vicinity and that the sun is getting low; hence the need for quick action.

Or he may abandon his temporary overt acts of trial-and-success and sit down to *think* it over. Thinking may lead to further trial-and-success efforts but his ability to think gives him an advantage that animals show little or no signs of having.

The animal, it is true, would depend upon his instinctive equipment in a dense forest but there is nothing in the man's instinctive equipment to lead him out of the forest. Further, he has no established way, no habits for dealing with the situation. Unable to get out by trial-and-success he *must* think, and, in thinking, he may summon up personal experiences faintly analogous, or experiences of others of which he has heard or about which he has read.

We may say, therefore, that thinking takes place when instinct and habit do not supply sufficient direction to behavior.

Trends in Everyday Thinking.—Thinking takes different trends in different individuals and at different times in the same individual. All of us at times think in symbols, while some think in mathematical symbols, for example, much more easily than others. Some learn foreign languages with ease, while some perfect the mother tongue to the point that nearly all thinking is done in terms of description.

Consecutive Thinking.—All normal persons tend to think consecutively, i.e., in their thinking one thought stimulates another and they follow through to some sort of a solution. When we talk to ourselves we think consecutively, and the public speaker who has announced that he will make four points, then succeeds in presenting them—First, Second, Third, and Finally, has developed consecutive thinking to a high degree.

Exceptions to the normal progress of consecutive thinking appear in two forms of absentmindedness. The first form is illustrated in the habit of a baseball player who must continually remind himself that there are “two down and the bases filled.” In the second form thinking remains oriented, i.e., no matter what distractions come and what interruptions take place, thinking tends to hew to the line, to seek a single predicted solution. When too greatly oriented, too greatly concentrated, one may lose touch with immediate problems or return to problems thoroughly discussed and long ago dismissed by others.

Condensed Thinking.—Through increased experience in thinking former practices are short-circuited and condensed. In learning to read, the child must vocalize the words and syllables. As he gains in experience eye-span and rate of reading increase until phrases and even sentences are comprehended at a glance. The rapid reader, intent upon securing the gist of what he reads rather than the forms employed in presenting it, sometimes succeeds in comprehending whole pages in the time it would take others to comprehend a sentence.

Thus thinking often goes ahead in leaps and bounds. Language habits help; the phrases one employs may serve as signals for the thinking to follow, as may the gesture of

a hand, the shrug of a shoulder, or the lifting of an eyebrow. However, condensation may take place without these aids. James speaks of this in referring to the conjunction of two minds of a high order interested in kindred subjects. Before one of them is half through a sentence, he says, the other knows his meaning and replies. In fact, there may be such communion of thought that words are unnecessary.

Intuitive Thinking.—Condensed thinking of the kind to which James referred is sometimes spoken of as intuitive thinking; one is able to divine what another is about to say. Intuitive thinking, though, appears in a commoner form. Sometimes one *knows* a thing to be true simply because he *feels* it is. That this type of thinking is related to feeling is seen in the fact that it is attended by differing degrees of satisfaction. It is, in reality, perception without full meaning, or the presentation of knowledge without resort to reason.

The way one “feels” about an idea may cause that idea to be rejected or thrown into the background of consciousness, or may cause it to be expanded into an ideal. An ideal, we said, is an idea plus feeling; but it is also an idea with a goal.

Thought and Idea.—One’s consciousness is his awareness of sensations. When he rises above the levels of instinct and habit and begins to think, consciousness takes an added rôle in that it becomes awareness of thought.

To know a thing, one must recognize it, be familiar with it, and understand it. Thought, therefore, in its simplest form, is a moment of knowing consciousness: and an idea is a suggestive thought or a group of thoughts. Let us illustrate.

A student, who usually rides home after class in a cross-

town bus, suddenly becomes conscious of the fact that he is without money. This thought is followed by other thoughts—he must get home—he will be late for dinner—even late for his art class in the evening.

The first thought (the absence of funds), being suggestive, is expanded into an idea. He devises ways and means for getting home. He indulges in *free* ideas—ideas derived from past experience to be applied to a new situation; he has sold things to get money; he has borrowed money from friends. He searches for some of his friends, but they are gone. The concept is complete—why not the instructor he has just left, who knows him well? He can borrow from him until tomorrow! The idea has “dawned” from thoughts flitting here and there in the darkness of conflicting conscious elements.

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Simple and Generalized Concepts.—A *simple concept* is the name given to the memory-image of an object. The image of a tree arises in one's memory and he has the idea *tree*. But, when he thinks about the tree—that it is green, in bloom, is deciduous, or waves in the wind—he gets a general idea or a generalized concept of the tree, in which he combines its various elements. As a result of the study of natural science he may even go beyond this and see *tree* as the name of a species or even as a class of plant life but, except in imagination, he cannot create a tree, so he must stop there.

Imageless Thought.—When one develops the power to think about a thought and to have an idea of an idea has he reached the point where he is able to think without images? In answer to this question Seashore says that the image is a fickle thing to observe and that, while much of our

thinking is so nearly automatic that we are scarcely conscious of images, we cannot think without them; an image arises in connection with each and every thought.

Thought and Language.—So long as one depends upon visual impressions only he need not resort to spoken words; but thought, ordinarily, does not let him stop with signaling movements; it demands complete descriptions of objects or situations. To supply descriptions one must employ words—words which convey meanings of each part or element of the object or situation. Words are thus not only signs of thought; they may become thoughts.

What relationship is there therefore between language and thought. Watson describes thought as inner speech. A word becomes a thought, he says, when, although it is not spoken aloud or even whispered, it is uttered implicitly so that others can observe it. Curti takes exception to this theory by saying that other symbols (non-verbal) sometimes function in the same capacity. If thought were merely internal speech, she says, a child could not have ideas before learning to speak.

Sources of and Kinds of Thought.—It is obvious that the thought processes are linked with instinct and habit, with sense-perception, with memory and imagination, with values and concepts, and with feelings and goals. This is to say that thought is related not only to mechanical modes of behavior but to all conscious states as well. With consciousness thought moves as a stream, developing beliefs, sentiments, faiths, judgments, reasoning, intelligence, abstraction, and intellect. In other words, learning to think involves processes which vary from the very simple to the highly complex.

Types of Thinking.—The fact that thinking does vary greatly makes it possible to designate certain types of thinking, as follows:

1. *Reverie*: a type of thinking growing out of feeling-tones and taking the form of day dreams and castles in Spain. This type is often called autistic thinking—thinking that is sufficient in itself and not subjected to any criticism. It serves the sole purpose of gratifying some desire.

2. *Wishful thinking*: thinking which involves ideals and aspirations. One wishes for money, property, position, or power yet builds no habits in the direction of accumulation. This type of thinking is very closely related to reverie in that it seeks to gratify desire, yet is distinguished from reverie in two particulars: it involves greater effort and activity, and is often subjected to inward criticism.

3. *Empirical thinking*: thinking based upon experience rather than upon scientific knowledge. One thinks empirically when he decides to eat the things the tastes of which have always been pleasant, without thinking of them in terms of food value; or when he goes outdoors without a coat in seasons of changeable weather.

4. *Reasoning*: thinking that involves passing from one judgment to another, and finally reaching a conclusion. One indulges in reasoning, for example, when he defends his own acts, opinions, or beliefs by attempting to summon reasonable arguments in support of them. This is rationalization. It is basically instinctive.

5. *Critical thinking*: thinking which breaks up the whole into smaller and smaller units for purposes of analysis. It includes:

(a) reflective thinking: careful consideration of any belief or supposed form of knowledge in the light of its origins

and outcomes. To reflect upon a thing is not only to look back upon it but forward upon it as well.

(b) abstraction: separation of a quality from the thing to which it belongs.

6. *Creative thinking*: thinking in which some missing element is substituted, or new combinations made of factors already present. The music composer who completes the air by the insertion of the "inevitable note" or rearranges the scores so that harmony is achieved does creative thinking.

Steps in the Reasoning Process.—The type of thinking which involves the most routine is empirical thinking, in which one's situations are without complication; while the least routine thinking is done in reasoning, in which one's personal needs are characterized by complication. The steps or stages in the reasoning process may be as many as five, as shown in the following outline presented by Dewey:

1. *A felt difficulty*. The individual meets an obstruction in the form of a physical barrier which he cannot surmount or in the form of a theoretical question, such as keeping an engagement at a certain hour when there is not time to cover the distance.

2. *Diagnosis*. The individual observes conditions and makes random suggestions as to solutions. Then he becomes discerning and attempts to go to the heart of the matter.

3. *Hypothesis*. Here suggestion becomes speculative, even adventurous. Inferences go beyond what is actually present but suggested conclusions are but tentatively entertained. The individual makes a guess, or sets up an hypothesis, but suspends belief, while cultivating a variety of suggestions.

4. *Deductions*. The individual looks into suggestions more thoroughly by the application of rules, traditional say-

ings, and symbolic forms. If this brings the solution, i.e., if one is able to surmount the difficulty, the process of reasoning is culminated; if not, other implications are followed out.

5. *Verification.* The conjectural idea must be verified. All conditions demanded by the theory must be fulfilled. Observation may supply corroboration; if not, the individual must experiment further.

Deductive and Inductive Thinking.—In employing the rational method, the individual may use one or both of two different forms of thinking—deductive and inductive.

One resorts to *deductive* thinking when he makes deductions or inferences from a general law, the truth of which may or may not have been established. For example, upon entering a yard to deliver the evening newspaper, a boy is confronted by a dog which rushes toward him ferociously. "A barking dog never bites," he says to himself, and deduces from the adage that this dog will not bite and that it is safe for him to enter the yard. This is deductive thinking on the elementary level.

One resorts to *inductive* thinking when he generalizes from a number of known facts. His dog barks but does not bite. His friend's collie barks but never bites. His uncle's airedale barks but never bites. Therefore, "a barking dog never bites."

However, one of these forms of thinking need not be used to the exclusion of the other. One knows, for instance, that the growth of cities is influenced by the presence of railroads. Using this as a general law, he may reason that Indianapolis will become a very large city because it has a great many railroads. He reasons further, though, that cities larger than Indianapolis, such as Detroit, Chicago, New York,

Boston, Los Angeles, and San Francisco, have water transport. Therefore, water transport must be necessary if a city is to become *very* large. Therefore again, Indianapolis may not become one of the *very* large cities. Thus he swings from deduction to induction and back to deduction.

Obstacles to Thinking.—Dimnet lists and discusses the common obstacles to thinking. Briefly summed up they are as follows:

1. *Stupidity.* To stupidity everything is an obstacle.
2. *Inferiority complex.* A double state of mind in which some threatening or discouraging phantasm is doing its best to neutralize the healthy influence we do not wish to lose. (The inferiority complex is to be discussed later in this book.)
3. *Imitation and gregariousness.* A combination of instinctive imitation with the crowd's antipathy to distinction grinds thought out to leave only the human gramophone. Gregariousness makes individual thinking an insuperable difficulty.
4. *Education* of the type that strains rather than trains.
5. *Everyday life*, in that it wears out the individual's thinking capacity.
6. *Reading* without full comprehension; also certain kinds of materials read.
7. *Conversation.* The lost art. Conversing without anything to say stands in the way of real thinking.

Will and the Thought Process.—No progress is to be made in the higher types of thinking unless will is brought into exercise. Ogden points out that judgment, appearing as it does at the highest stage of reasoning, is not instinctive or habitual; it is volitional. A judgment is always *willed*,

he says ; choice is not always judgment, but judgment always requires choice.

The relationship between will and the thought process may be shown in this way:

Consciousness is mobile ; it flows in a stream. Thoughts, with consciousness, flow in a stream. Consciousness is the result of learning, and learning is not only instinctive but results from sense-experience. Thoughts result from conscious states and are, therefore, based in mechanical modes of behavior. However, thoughts may be controlled and the stream may be diverted to other channels.

One cannot, by taking thought, add one inch to his (physical) stature, but he can change the direction of his mental processes. He does this through will, the "faculty of effort" which pervades consciousness. Purpose and desire function to bring one up out of the levels of the affective life to the levels of the intellectual life. Through the use of will one learns to think by thinking and, by thinking, he becomes intellectual.

The final goal, though, is not intellectuality but rather intelligent behavior. The difference between the two will be brought out in a later chapter.

Possibilities of Thought Transference.—No discussion of the thought process is complete without mention of the theory of thought transference or *telepathy*. According to that theory, communication between mind and mind may take place otherwise than through the known channels of sense. Seashore lists the various kinds of experimental work carried on in the effort to prove this theory. They are:

1. An hypnotic experiment in two forms: (a) the hypnotist tastes a substance and the subject is expected to experi-

ence the same taste ; and (b) an attempt is made to hypnotize a person at a distance without prearrangement.

2. Two observers, one sitting in one room and the other sitting in another room. Each tries to write down or sketch what is seen in the other room.

3. One person tries to make another, seated some distance in front, turn around at a telepathic command.

4. One person attempts to answer questions mentally-asked by a distant person.

5. One person agrees with another that, at some time known only to himself, he shall appear in an hallucination on conditions set by himself.

Along with these experiments come practices in mind reading for public entertainment, for pay, for private devotion, and for spiritual edification.

Seashore says that, although investigations in this field have been profitable for scientific psychology, through revealing general laws and hidden resources of the human mind, through giving valuable hints on the sources of error in psychological experiments, and through revealing the wonders of automatism, on present evidence, telepathy has not been proved. It needs and should have much more extended study.

TEACHING TO THINK

The child's instinctive tendencies and habits, through impulsive action resulting from an inner drive toward activity, seek solutions to his problems. Satisfying solutions, though, are infrequently arrived at, and this is because: (1) instincts so often lead into blind alleys; and (2) habits of reacting the same way each time become so firmly fixed. Failing to get satisfaction, the nervous system insists upon new stimuli and this demands certain types of thinking whether the child

wills or not, such types as reverie, wishful thinking, empirical thinking, and rationalization, all indirect results of inherited tendencies.

Beyond these four types of thinking the child is not likely to go *unless* under direction, and it is to the problems of the redirection of his thinking that we now turn.

Redirection of Natural Types of Thinking.—In guiding the child in his thinking we begin with the types natural to him and build on the types which may be perfected only through training. Our first question is, how may the natural types best be utilized? With regard to the first two types that question was partly answered in our discussion of imagination and memory, but we may repeat here for emphasis.

Day Dreaming and Wishing.—The day dream, based in fancy or in memories of past experience, is, even in the child, a form of absentmindedness. From the time he begins to give shape to mental images there is, around all his conscious life, an eddy of free association that keeps lapping over into consciousness. It is difficult to keep this "dream consciousness" in check, to keep it subliminal, or below the threshold of consciousness. Even when the child is concentrated on problem-solving it washes over, and there is danger that it will become the main stream, or, in other words, become a fixed habit of thinking.

The vividness of the child's wish is determined by the strength of his impulses and emotions. Objects which make no appeal to instinctive reactions do not prompt intensive wishing. For these the wish is sporadic. On the other hand, objects which call into activity such impulsive reactions as play, sympathy, love, ambition, and pride create defi-

nite yearnings, and the latter have both values and dangers.

Our hope for balance, sanity, and mental efficiency lies in the power to keep day dreaming and wishing subliminal. This means that the child must be taught to inhibit impulses which would lead to perfected habits of dreaming and wishing; and it also means that, with dreaming and wishing within call, reverie and wishful thinking are not to be entirely inhibited but utilized in the development of better images and stronger ideals. As we have pointed out, the child, who in his dream pictures himself a hero, may, through proper direction, become heroic; and the child, whose wishing is transformed into habit building justifiably based in wishing, has a good start toward balance and mental efficiency.

Empirical Thinking and Rationalization.—Empirical thinking we have defined as thinking based upon experience rather than upon scientific knowledge. Inferences are built up under the influence of particular experiences not arranged in logical order. The child says, "It always rains on picnic day." When asked why he thinks so, he replies, "I do not know, but it has rained every time we've tried to have a picnic." He is thinking empirically. He does not see any connection between the picnic season and the thunder-storm season, has no law or principle to guide him to a conclusion.

There is at least one advantage in this type of thinking; sometimes it is *adequate*. To conclude that it will rain on picnic day and go prepared is better than to overlook the possibility of rain. There are, though, three disadvantages. These are given by Dewey as follows: (1) empirical thinking often leads to false beliefs and superstitions; (2) it does not enable one to cope with new situations; and (3) it leads to laziness, presumption, and dogmatism.

The child rationalizes when he justifies an action he has

taken or a decision he has made. A good example of this is the well-known story of the Negro boy who, when discovered taking chickens from a hen-house, answered to the cry, "Who's in there?": "Nobody but us chickens!" He was rationalizing, i.e., coming to his own defense as rapidly as possible.

Children rationalize instinctively. It is their way of meeting criticism from others and from themselves. They may not know, as Woodworth says, the real motive for an act, or may not care to admit it. They try to present, therefore, some general principle which will make an act acceptable.

Naturally the teacher will not attempt to *break* habits of empirical thinking and rationalization. They are but to be substituted for and redirected. The facts of sense-experience are to be drawn upon in the demonstration of relative values. The child is to be given meaning in terms of scientific law and his false beliefs and superstitions dispelled. In effecting these things, much of his rationalizing, guided by the scientific point of view, will be reduced to purposeful thinking, and his empirical conclusions, such as "it always rains on picnic day," will be raised to the level of logical thinking.

Conditions Requisite to Thinking.—Thinking always requires knowledge and depends upon observation. In thinking, the child manipulates facts previously observed. He remembers things he has seen and puts them together, but he also thinks over problems and situations not immediately present and lays plans for future actions.

Poor thinking, though, is sure to take place. When it does it results from a single cause or a combination of causes: the child may have an inadequate supply of facts; or the facts he has may not be reliable nor relevant to the problem; or the child may have had no training in thinking.

Development of Logical Thinking.—Learning to think logically is learning to reason, and it is the goal of all education to train the child in the power to reason.

There should be no doubt as to the possibility of training a normal child to reason or as to the motive for so doing. In establishing proof of reasoning ability we have only to remind ourselves that (1) each normal child rationalizes, and (2) many children are born with the capacity for good logical memory.

Bagley believes that reasoning can be induced in the following ways:

1. By instruction in methods of reasoning, i.e., trained to observe, compare, abstract, and generalize, to avoid hasty conclusions and to analyze.

2. By providing ideal patterns for reasoning.

3. By emphasizing the reasoning attitude as contrasted with the emotional attitude or the attitude of trial-and-success.

4. By demonstrating the best methods for using accurate knowledge already accumulated.

As to the motive for training in reasoning, if we had no other than that given by Burnham, it would be enough. Burnham states that the scientific habit of correcting one's reasoning by reference to facts not only results in confidence, security, and satisfaction in the trustworthiness of the knowledge obtained but, in many situations, saves the individual from the beginnings of mental disorder.

In the past there has been much disagreement as to when the child begins to reason and as to whether or not we should distinguish between the reasoning of children and that of adults. As the result of much experimentation, psychologists are agreed that children do reason but that their reasoning is fragmentary and unreliable; they have flashes of reason-

ing power, but their thinking lacks continuity and cannot be relied upon to stay reasonable. As Gordon puts it, the child is a hasty generalizer; he jumps at conclusions from one or two particulars and has little desire to verify his conclusions. He does not have the power to suspend judgment as has the adult.

Discontinuous Judgments.—Piaget calls the period from about six to eight years in the child's life the stage of unbelief and states that the reasoning of the young child before seven or eight consists of a series of discontinuous judgments. Up to that time the child is reasoning only for himself; between eight and twelve he develops a consciousness of his mental operations and begins to realize the logical processes involved in thinking.

Process of Gradual Growth.—Psychologists are agreed also that, while it is not until after the ages of eleven or twelve that the child can carry on the abstract type of logical thinking, there is no sharp line between the thinking of children and the reasoning of adults. Arlitt says that children can and do reason relatively well when the problem is suited to the level they have reached, and Ogden agrees with this but adds that we must make sure that the children sanction the steps taken in the development of a subject if they are to reason.

Rules for Developing Logical Thinking.—The rules for developing logical thinking are rather clearly defined. They are as follows:

1. *Select from the child's experience or from the subject-matter of the classroom a difficulty to be solved.*
2. *Cause the child to analyse the difficulty and to state it in the form of a problem.*

3. *Get the child to suggest solutions and have him try these out, developing them by induction and deduction.*

4. *Have the child state conclusions he has reached.*

5. *See that the child verifies his conclusions by further observation and experimentation.*

Probably the most important phase of reasoning, says Pillsbury, is the selection of the correct suggestion when it comes. The child's experience in a particular field and his knowledge of that field will largely determine his selections. If he is to be trained in reasoning he must have accurate knowledge and must be repeatedly warned against accepting everything as true and final.

Development of Critical Thinking.—When training in logical thinking is effective, critical thinking takes place as a matter of course. Critical thinking, as we have said, is the breaking up of the whole into smaller and smaller units for purposes of analysis.

Thinking by Analysis.—The child is analyzing when he attempts to answer questions of why and how, and, in answering such questions, he must do a certain amount of abstract thinking. Abstraction, we said, is the separation of a quality from the thing to which it belongs. If the child picks out qualities, considers them in terms of past experience, and sees their relationship to each other, he is thinking abstractly. In thinking abstractly he is aided in the process of reasoning, particularly in making generalizations (general summaries before reaching conclusions).

Thinking by Synthesis.—To prevent the child from accepting suggestions without criticism he must be caused to maintain states of doubt and to carry on systematic inquiries.

In doing this he will think reflectively, i.e., turn things over in his mind and hunt for additional evidence, a procedure which, according to Dewey, is the most important factor in the growth of good mental habits.

In turning things over in his mind the child attempts to establish values. He puts a valuation on a fact, a quality, or a principle and places it with reference to his conclusion, and, when he does this, he is thinking by synthesis; that is, he is giving the fact, quality, or principle its context.

Correlation of the Two. —Every judgment the child makes is analytic in the sense that it involves discrimination—a dropping out of facts irrelevant to the conclusion; and every judgment is synthetic in so far as it gathers in the mind an inclusive situation which encircles the selected facts.

From what we have already said it is obvious that the child's tendencies are not in the direction of that type of thinking known as *critical analysis*. We know, however, that the normal child can be taught to answer questions of why and how, that he can be taught to see relationships between facts and between things, and that, so far as experience and knowledge will permit, he can be taught to establish values. This means that, by example, he can be caused to do a limited amount of elementary analyzing, and, if he learns to analyze, it is probable that he will also learn, as he matures, to do a limited amount of synthetic thinking. Analysis leads to synthesis and synthesis perfects analysis. Each is a correlative of the other and they team together as naturally as induction and deduction.

Rules for Developing Critical Thinking.—The rules for helping a child learn to think critically may be stated as follows:

1. *State the problem clearly and restate it, if necessary, in different words.*
2. *Recall related experiences or general rules which will serve as suggestions for solutions.*
3. *Criticize all suggestions thoroughly by reference to facts in everyday experience, in order that proportionate values may be established.*
4. *Cause the child to criticize his own suggestions by keeping the element of doubt alive.*
5. *Help the child clear up his thinking by having him organize the material of the problem in an outline on the blackboard or on paper, encouraging the use of diagrams and graphs.*
6. *Insist upon general summaries at appropriate points.*
7. *See that the conclusion is sound and see that the child sees its soundness.*

Development of Creative Thinking.—Creative thinking is usually described as an inborn capacity and particularly that of the genius. Woodworth, in defining genius, says that it is at least this: native capacity of a very high order for perceiving and handling a certain class of objects, the class differing with the particular bent of the individual's genius. In defining genius Woodworth has at the same time defined creative thought.

Range of Creative Thought.—Dimnet raises a question as to whether creative thought means genius. The answer is yes, he says, with this qualification: any creation of any description, by the humblest artisan as well as by the superman, is a product of a state of mind which should be called genius.

Dimnet states that we are likely to forget that genius de-

pend upon the data within its reach, that, for example, Archimedes could not have devised Edison's inventions, and that we are likely to forget that genius is not genius all the time, although it is superior all the time.

Observation has much to do with creative thought. A child, experienced in analyzing, may detect the omission of an element without which a solution cannot be reached. He observes the omission and makes the substitution. Others failing to observe often miss the chance to do creative thinking, and creative thinking by substitution is a type of thinking that may range all the way from the completion of a picture puzzle to the establishment of an astronomical law through the inclusion of one missing symbol.

Thinking and Creative Imagination.—The child who will do creative thinking is one who has a creative imagination. Such a child will break away from the ordinary methods of thinking and will make new combinations. He will try to fill in missing elements, although a sufficient number of elements may be there already. He will seek for relationships that are not established. He will imagine conditions not common to or obvious in concrete situations. He may over-shoot the mark but he will be thinking creatively.

Creative Thinking Possible to Many.—Creative thinking, within limits, is possible to many children. Dearborn tells of creative work being done at the Lincoln School of Teachers College, Columbia University. Even the primary children, he says, sing words of their own composition to melodies of their own creation. The children are encouraged to create and, in the upper grades, to the creation of words and music is added the construction of musical instruments used in the reproduction of their own and other music.

Upper Limits to Creative Thinking.—Unfortunately not a very large percentage of the children in the schools will indulge in a type of thinking that might mark them off as geniuses; according to Terman, not more than one or two per cent. The others will not become great inventors or great composers, in most cases because they do not have the native capacity, the creative imagination, to do so. There are two other reasons, however. The first of these we have mentioned—some potential geniuses do not have the proper data within reach, and the second is that teachers often fail to understand such children; they see in their inventive tendencies nothing but disturbing elements in the classroom.

Creative Thinking to Be Encouraged.—There is danger in such an attitude, of course. In unguarded criticism of the child's suggestions for solutions of problems, in inhibiting creative imagination, inventive genius may be crushed. It is best, therefore, to give the child the benefit of the doubt and to encourage his creative thinking even though at times it does not seem to lead in the direction of desirable goals.

Rules for Developing Creative Thinking.—Since creative thinking is anything but regular in its methods of procedure, specific rules for its redirection are to be avoided. We do know, however, what conditions it requires for its encouragement and may make recommendations accordingly:

1. *Encourage the freshness and mastery of subject-matter characteristic of the child who does creative thinking.* (Woodworth.)
2. *Get him to strive for results.* (Woodworth.)
3. *Keep him hopeful, eager, and ready to take a chance.* (Woodworth.)

4. *Get him to be conscious of his own personality.* (Dimnet.)

5. *Get him to find his own vein—the thing he does with the greatest ease and with the greatest enjoyment.* (Dimnet.)

6. *Give free rein to his inventive genius for the time being and come around with criticism later.* (James.)

Testing the Power to Think.—In attempting to teach the child to think, the teacher, sooner or later, will see the need for testing the results of teaching, not in the sense that the child's knowledge is to be tested but rather his ability to organize his knowledge. The immediate objective is to measure how well the child has learned to think, and, in applying the test, further development of the thought process should be encouraged. This demands the use of the old-type, or essay, examination.

Bagley sets up the following rules for the use of the examination:

1. *Use the examination for organizing facts and principles.*

2. *Make the questions large and comprehensive.*

3. *Think of the questions as means for helping the child learn with the intent to master permanently.*

Other means of measurement will be discussed in connection with mental growth in the next chapter.

Teaching for Open-Mindedness.—It is well to get the child in the habit of qualifying his conclusions by the amount of evidence at hand. This is conducive to open-mindedness, and the child's mind must be far enough open to admit new facts while not so far open that facts of importance already learned are not retained. It is the only way to cause him to

reach logical conclusions, and logical conclusions must be reached if the thought process is to develop properly.

This introduces the question as to whether the child can be taught *how* to think without being taught *what* to think. The rule in this connection is best stated as follows:

Give the child facts about which to think, but at the same time, so train him in the art of establishing values and relationships that what to think will be his own affair.

Helps to Thinking.—There are many ways that the child can be helped in his thinking. Dimnet has outlined them for the adult. Applied to the training of the child, they may be briefly summarized and restated as follows:

1. *Give the child occasional opportunity to be alone; he cannot be himself unless he is by himself once in a while.*
2. *Encourage concentration.*
3. *Insist upon making time by saving it, not frittering it away.*
4. *Expose the child to thought-producing images.*
5. *Do not forget that simple elemental love always opens up the intellect and gives it the freedom of genius.*
6. *Look for the higher types of thinking in books of the better sort and let them serve as examples.*
7. *Impress upon the child that if he would learn to think he must never read but always study.*
8. *Teach the child to criticize what he comprehends in his reading.*
9. *Get the child to go over the data in mind—reflect upon them, write about them, and preserve them by keeping track of what he has learned.*
10. *Appeal to the child to think his best rather than his easiest.*

QUESTIONS AND PROBLEMS

1. In the normal person when is thinking sure to take place?
2. Give an illustration of consecutive thinking and explain absentmindedness.
3. What is condensed thinking and what are its manifestations?
4. What is meant by the term *intuitive thought*?
5. By illustration show the relationship between a thought and an idea.
6. Point out the difference between a simple concept and a generalized concept.
7. Do you agree that we cannot think without images? Give the reasons for your answer.
8. What is the behavioristic theory of the relationship of thought to language?
9. Hoarseness may sometimes be traced to intense thought. How do you account for that?
10. Prepare a list of six types of thinking and show what each involves.
11. By illustration show the five steps in the reasoning process.
12. Give original examples of deductive and inductive thinking.
13. What are the seven obstacles to thinking as given by Dimnet?
14. List five types of experiments in thought transference. Which of these seems to lend the best evidence of proof?
15. Show what may be done in redirecting the child's tendencies to day dream and wish.
16. How are empirical thinking and rationalization best redirected?
17. What are the two conditions requisite to thinking?
18. What are the common causes for poor thinking?
19. What are the chief differences between the reasoning of the child and that of the adult?

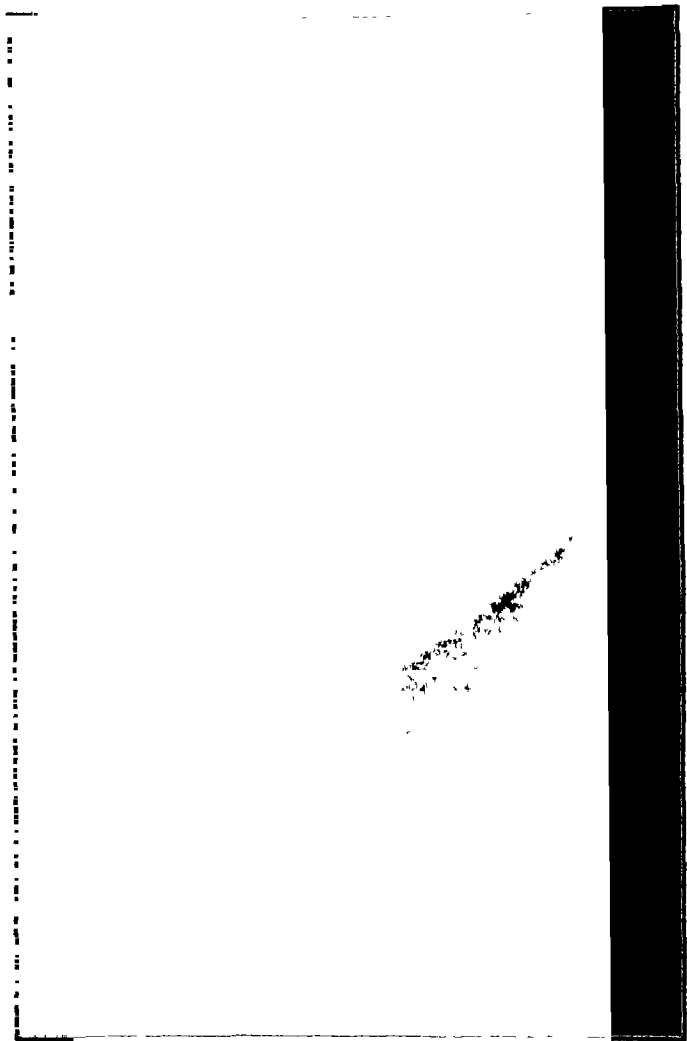
20. State in your own words the rules for developing logical thinking.
21. Give an example that explains thinking by analysis.
22. Give an example that explains thinking by synthesis.
23. How are analysis and synthesis correlated?
24. State in your own words the rules for developing critical thinking.
25. What, according to Dimnet, should be the range of creative thought?
26. What is actually the range of creative thought among school children?
27. State in your own words the rules for developing creative thinking.
28. What should be the real functions of the examination?
29. Is it possible to guide a child to conclusions without teaching him *what* to think?
30. List ten helps to thinking.

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EDWARD L THORNDIKE

CHAPTER IX

Mental Growth and Its Measurement

The simplest mind we could discover, says McDougall, is one which would respond to a sense-impression by an act of knowing, a becoming aware of something there, an object in space. Beginning with this simplest of mentality we find gradations of "mindedness" which vary all the way to genius. Let us list, therefore, some of the conditions of extreme variation, treating each of them briefly.

The Definitely Feeble-minded.—Among the definitely feeble-minded are the idiots, imbeciles, and morons.

The mind of the idiot is relatively blank. Never does it grow beyond that of the average three-year-old child.

The imbecile can be taught to work under direction, but is not able to earn his own living. Never does he grow beyond the average for eight-year-old children.

The moron can be trained to earn his own living and to take care of his personal needs but, because he is unable to distinguish between right and wrong, between good and bad, and between beautiful and ugly, is unable to compete on common ground with the normal. There are three grades of morons—high, middle, and low—but even the high-grade moron never grows beyond the average for twelve-year-old children. High-grade morons, though short in powers of discrimination, often pass for normal.

The Definitely Superior.—The supernormal child, in proportion to his grade of superiority, is characterized by:

more than average alertness; eagerness; superior coördination of movements; vividness of imagination; good logical memory; and clear understanding; provided, of course, he is stimulated by his environment to react in ways that bring out these qualities.

The superior group ranges all the way from a level that is a theoretical average for 20-year-old adults to a level that is a theoretical average for 28-year-old adults.

The Delinquent and Unstable.—Delinquency in children results from unwillingness or inability to control behavior. It is found among the supernormal as well as the subnormal.

Instability, or lack of self-control, is characterized by extreme nervousness, hyper-sensitiveness, and undue emotional manifestations. It may, through the welling up of suppressed inherent traits or through the effects of environment, come to be the lot of even the previously normal.

Disordered Mentality.—The problems of disordered mentality are studied by two methods: the physiological and the psychological. The physiological method treats the evidences of mental disorder as manifestations of changes occurring in the brain, changes due to physical injury or to chemical injury. The psychological method treats the evidences of mental disorder as states of mind, with no reference to brain processes. The psychologist speaks of marked mental disorders as *psychoses* and of disorders of persons apparently well as *psychoneuroses*.

The following mental disorders are listed and described by Hart:

1. *Dementia*. An acquired condition in which the mental equipment has undergone a process of decay. *Dementia praecox* (precocious or early) is the insanity of adolescence.

2. *Manic excitement.* A constant state of activity in which the person rushes from one new occupation to another; is incapable of carrying out any connected train of thought.

3. *Depression.* The person is slow in actions, thinks with difficulty, and is miserable and unhappy.

4. *Apathy.* The person has no interests or desires and therefore makes no use of his mental faculties.

5. *Somnambulism.* The person suddenly ceases what he is doing and begins to act out some experience with somewhat the same motions as used by the sleep-walker.

6. *Hallucinations.* The person hears voices or sees images not heard or seen by others present.

7. *Delusions.* The person suffers from false beliefs, grandiose or persecutory. In the former he is an exalted personage—king, millionaire, or inventor; in the latter he believes that deliberate attempts are made to harm him in some way.

8. *Obsessions.* An idea constantly recurs despite all efforts to banish it.

9. *Stereotyped Action.* An action is carried out with monotonous repetition and regularity day in and day out.

10. *Alterations in Phraseology.* Phrases are curiously distorted, individual words are displaced or omitted, and all grammatical form seems to be lost.

11. *Hysteria.* Some intense idea or emotion leads to loss of function of some part of the body.

12. *Double Personality.* The person has a secondary personality. Two streams of consciousness flow along side by side within the same individual, the second stream active without disrupting the activities of the first stream.

Symptoms Often Normal.—Hart warns that many of these symptoms frequently occur in the experience of every

normal individual and implies that the mere fact that they do occur should not lead one to conclude that he is incipiently abnormal. Hart cites as examples: the melody which runs in one's head continuously and will not be banished; the absurd and irrelevant idea which keeps recurring in defiance of all laws of logic; and the irresistible impulse to touch every lamp post one passes. We have dissociated fragments of mind which pursue their own course without relation to conscious aims and desires. The symptoms of insanity differ from those of normal reaction in their intensity and in their seeming lack of adequate cause.

The Normal Mind.—Insanity has never been completely defined and, for that reason, normality is not clearly described. The best criterion for judging insanity is noticeably abnormal behavior. But each of us varies from the standard under certain conditions. That which is normal for one may not be normal for another, in as much as one tends to establish his own average of performance. Our general character of behavior, therefore, must determine in a general way how we are to be classified.

Conditions for Normality.—Burnham states that the essentials, without which a person cannot be quite sound mentally and with which (apart from accident, infection, or heredity) one can have no serious mental disorder, are as follows:

1. A *task* for which one feels responsible.
2. A *plan* which provides for purposive activity.
3. *Freedom* to take the task or leave it, and to form one's own plan.

Normal Mental Growth.—The above conditions for normality serve as a basis for considering mental growth in nor-

mal children and, in doing that, we may except all those who may be classified as definitely abnormal.

With respect to general mental growth Wheat speaks of the progression of growth as comprised of four periods:

1. The age of six, at which the child is a social creature interested primarily in people and their activities.

2. The age of nine, at which the child is an individualist with interests and motives centered in himself.

3. The age of twelve, at which the child is again a social creature, interested in social relationships but awkward in conforming to social demands because of self-consciousness.

4. The age of fifteen, at which the child is a second time an individualist, but this time with interests which lead him to seek and make use of means which will prepare him to take his place in society.

Each period, says Wheat, overlaps into the next, the characteristics of each resulting from those of the preceding period.

Mental Tests and Periodicity.—Freeman states that mental tests have shown clearly that the child grows in mental power or in learning capacity from the time of entering the kindergarten until later adolescence. Psychologists are not entirely agreed, he says, concerning the comparative rate of growth during different periods of childhood and youth, but the more recent and reliable evidence seems to show that the rate of growth is more nearly uniform throughout these periods than investigators formerly supposed.

Hall, for instance, held that new mental powers emerge at various periods of childhood, remain strong for a while, and then sometimes die out, but later studies have shown that where a fundamental capacity is measured it has its beginnings early in childhood and rises at varying rates until reach-

ing a maximum, i.e., growth in any measurable feature tends to proceed at a constant rate.

It is shown, however, that if rate of growth is to be constant, two conditions must exist: (1) environmental conditions must be ordinary or normal; and (2) the child must be normal or average in mentality. In his early studies Terman found that mental growth proceeds regularly for all grades of mentality, i.e., backward children may be expected to gain about as much from year to year and to continue to gain about as long as normal children or bright children. This has not proved to be the case. Mental growth may be considered to be regular for normal children, but, for subnormals and supernormals, there is little regularity of rate; the losses and gains contradict each other.

Growth Curves.—When the growth curves of individual children are compared it is found that they run parallel to each other, i.e., do not cross at any point. This means that, so far as normal children are concerned, they maintain the same relative rank in mentality until maturity; but it assumes at the same time a similarity of experience.

The growth curves for separate ages and grades tend to parallel each other, this tendency being strengthened, of course, by the practice of grouping children by grades and supplying for each grade the material for learning.

Upper Limits of Growth.—There is disagreement among psychologists as to the average age at which maximum mental stature is reached. Doll collected evidence to show that it should be set at thirteen. Tests given to groups of American soldiers during the World War caused it to be set at thirteen and a half. Dearborn decided upon fourteen or fifteen. Binet had selected fifteen as the upper limit. Terman

selected sixteen, as did Ballard in England. Yerkes and Wood, using a point-scale method, determined upon eighteen, as did Otis, using a group test. Thorndike found that the mental growth of high school pupils continues undiminished to the end of the high school period.

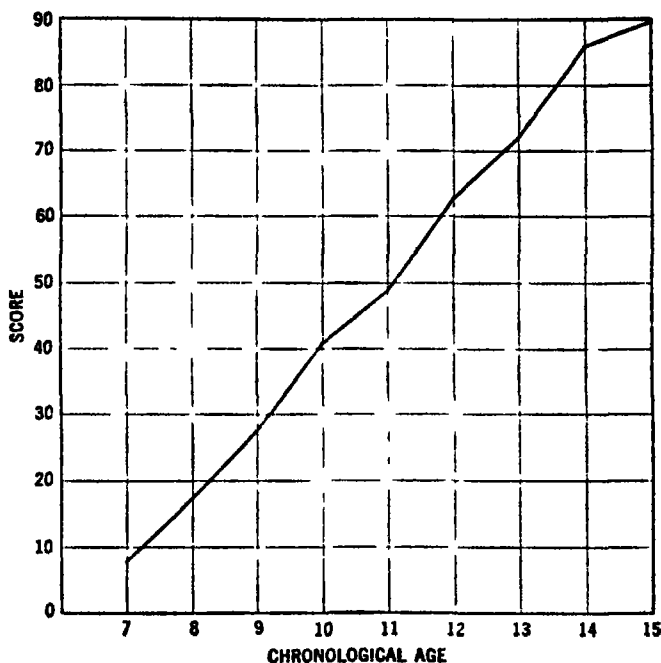


FIG 11

Growth Curve of Arithmetical Reasoning. (From Kelley-Ruch-Terman) Number of Children = 1540.

The levels determined upon are for average mentality. Gifted persons continue to develop mentally for some little time beyond the average period, while those whose native endowment is below average cease to develop at the age of twelve. As we have pointed out, the average limit in vertical growth for the idiot is three years; for the imbecile, eight

years; and for the moron, twelve years. Since nature fixes the level, vertical growth is considered to be a contribution of heredity. That level, for the gifted, is sometimes placed at a maximum of twenty-eight years.

Horizontal Growth.—When vertical growth, continuing for different individuals up to certain levels, ceases, horizon-

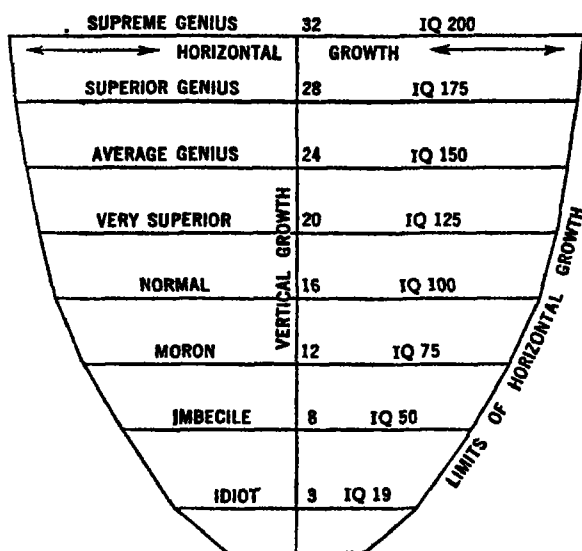


FIG. 12

Diagram showing horizontal and vertical growth in intelligence. Highest levels achieved are shown for idiots, imbeciles, and morons. (After Sandiford.)

tal growth, held in a comparative state of abeyance, substitutes for vertical growth. (See Fig. 12.) Education, while assisting in vertical growth, cannot alter the level but it determines the extent of horizontal development at any level.

Sandiford says of horizontal growth: Theoretically it is unlimited. In practice it exhibits fairly well defined limits

which seem to bear a direct relationship to its level on the vertical scale. In other words a genius can actually learn more than a subnormal. Nobody knows the exact relationship between height and width but that it is a positive one there is no shadow of doubt.

Mental Growth in Adults.—In discussing habit formation we stated that, in the adult, most of the habits formed are dependent in part on habits previously formed, that *new*

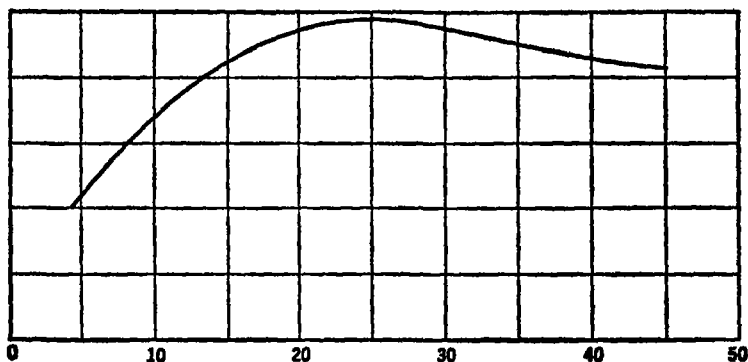


FIG. 13

General Form of the curve of the ability to learn in relation to age. (After Thorndike.)

modes of activity are acquired with great difficulty. This was the belief of James and is sanctioned by Hollingworth.

James believed that the individual ceases to get new ideas after the age of twenty-five, or thereabout, because disinterested curiosity is past, the mental grooves are set, and the power of assimilation is gone.

Thorndike has concluded that the adult can learn long after the age of twenty-five, that his ability to learn up to the age of forty-five is only slightly less than that of children. He states that the acme of ability to learn is located somewhere

between twenty and twenty-five, but that the decline from that point to about age forty-two is only about 13 to 15 per cent for a representative group of abilities. He states further that ages twenty-five to forty-five are superior to childhood and equal or superior to early adolescence in general ability to learn.

In explaining age changes in ability to learn, Thorndike lists six factors resulting in the ability to learn:

1. An inborn capacity to develop the ability to learn.
2. An inner growth of the ability to learn has taken place.
3. A possible degenerative effect of late age.
4. Training in specific habits of learning.
5. Training in study habits and other general patterns of conduct, or modes of response that affect learning.
6. Forgetting—the general effect of lapse of time without use upon acquired abilities.

The amount learned, Thorndike believes, depends upon various combinations of four factors: general health and energy; ability to learn; interest in learning; and opportunity.

As is seen, the theories of James and Thorndike are not directly contradictory. Each places the high point of learning near the age of twenty-five. James was speaking of getting *new* ideas; after twenty-five the individual gets but old ideas in seemingly new ways. Thorndike believes that the individual may continue to learn things in which there are new elements. In any event, years of maturity (experience) are sure to bring the normal mind wisdom.

The chief difference between the learning of the school child and that of the adult is the same as that which exists between knowledge and its application. The education of the adult, as Lindeman has stated it, is not a process of acquiring the tools of learning (fundamental subject-matters), but

rather a way of learning the relation between knowledge and living.

PROBLEMS FOR THE SCHOOL

In reviewing our discussion of the various levels of mentality we find that the idiot and the imbecile do not provide major problems in general education. The idiot, with a mental maximum of three years, and the imbecile, with an upper limit of eight years, are usually cared for in special institutions. Once in a while a high-grade imbecile is enrolled in the schools but the majority of feeble-minded are from the moron and borderline classes. The morons, with a mentality that will never develop beyond the average for children of eleven or twelve years, comprise about two per cent of the total school enrolment.

Dementia Cases.—Feeble-mindedness is congenital and, for that reason, many at that level are detected before any attempt has been made to give them regular schooling. Dementia, though, is acquired; normal mental equipment has undergone a process of decay; and the schools are not without a small percentage of developing dementia cases.

Dementia praecox cases are described as of four types:

- (1) *Simple type*: apathetic, often with peculiar behavior.
- (2) *Hebephrenic type*: silly, grimacing, with peculiar ideas usually absurd.
- (3) *Catatonic type*: has phases of stupor or excitement, the latter characterized by impulsive, queer, or stereotyped behavior and usually accompanied by hallucinations.
- (4) *Paranoid type*: has hallucinations and delusions, the latter characterized by ideas of persecution or grandeur often connectedly elaborated.

There is nothing teachers can do in the treatment of such

cases. They are described here merely that they may be more easily detected and recognized when they appear.

Two Extreme Groups.—At the opposite extreme from feeble-mindedness are the high grades of mentality, the genius group representing another two per cent of the total school population. The main tasks in teaching will be centered in the two extreme groups—the feeble-minded and the gifted, in the first because of the great difficulty in teaching them anything, and in the second because of the necessity for finding material suited to their high grades of mentality.

Variation in Adult Mental Levels.—As for adult education, we may expect a gradual but constant increase in the number of adults desirous of availing themselves of more education. Among them also we shall find various levels of “mindedness,” ranging from borderline cases seeking naturalization to superior geniuses searching for new outlets for mental energy. They, like the children in the schools, must be given opportunity to grow horizontally.

Measurement of Mental Growth.—To locate and identify the exceptional child, whether he be of superior or inferior mentality, is not a difficult task for the observant teacher. A few days of contact with a group are ordinarily sufficient to reveal those children who vary from normal, and, in cases of doubt, a child may be tested for normality by being given a *task* and the *freedom* to perform it. He is not subnormal at least if he is able to *plan* consecutive steps for its performance.

Subnormality, however, is anything but regular in its manifestations and this is true in some degree of gifted mentality. Snap judgments, therefore, are not to be encouraged.

They lack the refining discriminations demanded by problems of variation. Not only will the teacher often mistake feeble-mindedness for dullness or slowness but, even where the fundamental test (the task) is applied, there is no way to estimate accurately the degree of superiority of the super-normal child.

Nothing is to be gained by guessing at the amount of variance from normality. One needs standard instruments which will show the degree of mental difference in children and will point the way to types of instruction best used at separate mental levels. For these purposes we have what are called mental-ability and mental-achievement tests.

The Old-Type, Essay Examination.—In discussing the problems of teaching to think we recommended the use of the essay examination to test the child's ability to organize and correlate facts. The old-type test, while allowing freedom of expression, has certain drawbacks. Among these are:

- (1) The test allows for the exercise of personal judgment on the part of the person doing the marking.
- (2) The sampling (selecting test material) must be limited to a small number of broad questions.
- (3) The test demands lengthy answers. If no writing were required twice as many questions might be asked.
- (4) The test encourages bluffing.

The old-type test used alone, therefore, does not give us a complete measure of the child's mental growth and its results should be supplemented by scores (marks) made on standardized mental-ability and mental-achievement tests.

Use of Mental-Ability Tests.—The types of mental-ability tests which have been evolved fall into two general

divisions: (1) individual tests; and (2) group tests. The individual tests were worked out first and their success in measuring individual ability led to the improvisation of group tests.

The best known and most widely used of the individual tests is the Stanford-Binet Scale. It provides for the determination of each child's mental age; that is, the tests are so graduated that a child's mental age may be found irrespective of his chronological, or actual, age.

The mental age by itself means practically nothing; it must be used in connection with the chronological age; the ratio between the mental age and the chronological age must be found. When such ratio is found, when the mental age is divided by the chronological age, the result is the intelligence quotient (*I.Q.*) Let us illustrate.

If a ten-year-old child has a mental age of ten, his *I.Q.* is 10 divided by 10, which is 1.00 or, for convenience, 100. An intelligence quotient of 100 is average or normal. Other levels are determined in the same way.

The Stanford-Binet Scale consists of 90 tests distributed as follows:

- (a) 6 tests at each age level from 3 to 10
- (b) 8 tests at the age level of 12
- (c) 6 tests at the age level of 14
- (d) 6 tests at average adult level
- (e) 6 tests at superior adult level
- (f) 16 alternative tests (to be used when a test has been rendered undesirable by coaching or otherwise)

The Scale begins with simple tests to determine the child's knowledge of common objects in his environment. He is asked to point to his nose, eyes, mouth, hair; to name familiar objects; to enumerate objects in a picture; to give his

sex; and to tell his last name. In later years he is asked to name colors; to distinguish between his right and left hand; to discover what is missing in a mutilated picture; to recognize familiar coins; to tell whether it is morning or afternoon; to name the days of the week; to tell the month, the day of the month and the year; to give the meanings of words in a series of vocabularies progressing in difficulty for the various ages tested.

Tests appearing at various points throughout the Scale may be classified as follows:

- (a) Range of information tests
- (b) Reasoning tests
- (c) Memory-span tests
- (d) Tests of verbal fluency and ingenuity
- (e) Tests involving knowledge of numbers and their relationships
- (f) Tests involving concrete visualization and eye-imagery
- (g) Performance tests
- (h) Detection, interpretation, and absurdities tests

Initial Program of Testing.—In order that the purposes served by the individual test may be understood, let us illustrate by use of a concrete situation. Let us take for example a first-grade class composed of thirty pupils. It is the beginning of the school year and none of these children has attended school before. This means that the teacher has no records of previous work and that she must discover individual differences by her own efforts. Unless she has some means for immediate detection of these differences it will be several weeks, through ordinary procedure, before these begin to be disclosed. She decides to use an individual examination and finally determines upon the Stanford-Binet.

Giving the Stanford-Binet.—In using the Stanford-Binet she must allow for each pupil an examination period of from thirty to forty minutes. The following time allowances are usually found sufficient:

Children	3- 5 years old.....	25-30 minutes
"	6- 8 " ".....	30-40 "
"	9-12 " ".....	40-50 "
"	13-15 " ".....	50-60 "
Adults.....		60-90 "

This will require a total working time of approximately eighteen hours and the teacher should succeed in testing all the children within the first ten days of school.

The test provides for methods of keeping records of each child's responses. By allowing as his basic age that point on the Scale at which the child passes all the tests and adding one year for each five tests he passes beyond that point, the teacher can determine his mental age. When the mental age is found it is divided by the chronological age to get the child's *I.Q.*

We showed above how the *I.Q.* of the average child is found. Let us here take two cases of variation. The teacher discovers that one six-year-old child has a mental age equal to the average eight-year-old child. Dividing 8 by 6 she gets 1.33, or 133. Another child of six has a mental age equal to the average four-year-old child. His *I.Q.* is 4 divided by 6, or .67, designated as 67.

The norms for the Stanford-Binet are expressed in ratings given the *I.Q.*, as follows:

<i>I.Q.</i>	CLASSIFICATION
Above 140.....	Near genius or genius
120-140.....	Very superior intelligence
110-120.....	Superior intelligence
90-110.....	Normal, or average, intelligence
80- 90.....	Dulness, rarely feeble-mindedness
70- 80.....	Borderline deficiency
Below 70.....	Definite feeble-mindedness

Obviously the child with an *I.Q.* of 133 is to be classified as very superior, and the child with an *I.Q.* of 67 is to be classified as definitely feeble-minded. Knowing that the intelligence quotient is least constant at these extreme levels the teacher will not be too certain of classification on this first test, but she knows that the general ratings given these two children will not be greatly altered by succeeding tests with the same scale.

Mentality Spread Over a Wide Range.—The thirty pupils composing this group are unselected, i.e., their actual ages only have served as a basis for admission to school. Consequently the teacher expects to find their mentality spread over a wide range, and that is exactly what she does find. The intelligence quotients of the thirty pupils give them the following ratings:

No.	I.Q.	CLASSIFICATION
1	Above 120	Very superior
3	110-120	Superior
21	90-110	Normal
4	80- 90	Dull
1	Below 70	Feeble-minded

By looking over these results the teacher knows the degrees of mentality with which she must deal. Within ten days she has found out things she might not have discovered within the school year. At least, if dependent alone upon her ability to estimate intelligence, she might have greatly misjudged the two extreme cases. Now she can plan her program so that the feeble-minded child will be given special attention and special training and the superior child promoted to the second grade as soon as it is feasible. The remaining twenty-eight will be instructed in the regular work as their abilities demand.

Caution for Inexperienced Examiners.—In administering the individual test the teacher cannot be too careful. There should be no more inaccuracy in calculating a child's intelligence quotient than one would countenance in calculating his own. No teacher, certainly, should attempt to use the Stanford-Binet Scale until he or she has had some preliminary practice under competent direction and is thoroughly grounded in the procedure.

Use of the Group Test.—The group test, never so reliable as the individual test, is meant to serve as a time saver; a whole class may be measured at one time. There are group tests to be used in each of the various school grades and we can best show their use by giving another example.

Let us take this time an eighth-grade group of forty pupils. In these variance of mentality will have been checked somewhat, especially at the lower levels, since the definitely feeble-minded will have failed to reach this grade. The teacher has records of previous performances on mental tests for these children but she desires to verify these for purposes of studying mental growth and for the knowledge she may gain first-hand by giving the tests herself.

She selects, for example, the Terman Group Test of Mental Ability, a test designed to measure the intelligence of children in grades 7 to 12. It is composed of ten separate tests, classified as follows:

- | | |
|-----------------------|----------------------|
| (1) Information | (6) Sentence meaning |
| (2) Best answer | (7) Analogies |
| (3) Word meaning | (8) Mixed sentences |
| (4) Logical selection | (9) Classification |
| (5) Arithmetic | (10) Number series |

The test is easy to give, easy to score, tests a wide range of abilities, and yields age and grade norms.

The teacher secures a supply of examination booklets and makes a close study of the directions for giving and scoring. She practices giving the test, paying close attention to proper inflection, enunciation, and emphasis. She secures a stop-watch for keeping time on the various test divisions. Then she examines the booklets to see that each is well printed and the pages cut. She keeps the papers well guarded until time for giving the test.

Giving the Group Test.—At a convenient time in the daily program the teacher asks the pupils to clear their desks, sees that each is provided with two well-sharpened pencils, and that distractions in the way of outside noises, bad lighting, and poor ventilation have been eliminated. She takes her place at the front of the room, asks monitors to distribute the booklets, and, for the next thirty-five or forty minutes, proceeds in a business-like way to give directions in clear and distinct tones.

At the end of the last test she has the booklets collected immediately, ties them in a bundle, and puts them away until she can find time to score them. The children will have enjoyed taking the test; they always do.

Scoring the Group Test.—Group tests, such as the one cited, usually come in more than one form, i.e., different subject-matter is used; and a scoring key is provided with each form. The test papers usually may be scored at the average rate of ten papers an hour. Assuming that to be true here, the teacher has gained, in four hours, information about the children that probably would have taken four weeks to secure.

TERMAN GROUP TEST SCORE	STANFORD- BINET MENTAL AGE	TERMAN GROUP TEST SCORE	STANFORD- BINET MENTAL AGE
210	19-6	110	14-10
205	19-3	105	14-7
200	19-0	100	14-4
195	18-9	95	14-1
190	18-7	90	13-11
185	18-4	85	13-8
180	18-1	80	13-5
175	17-10	75	13-2
170	17-7	70	12-11
165	17-5	65	12-9
160	17-2	60	12-6
155	16-11	55	12-3
150	16-8	50	12-0
145	16-5	45	11-9
140	16-3	40	11-6
135	16-0	35	11-4
130	15-9	30	11-1
125	15-6	25	10-10
120	15-3	20	10-7
115	15-1	15	10-4

TABLE I.—Giving Stanford-Binet mental-age equivalents for raw scores made on the Terman Group Test of Mental Ability.

Results of the Test.—The Terman Test allows a total possible score of 220, and the median (average) score for eighth-grade children is 87. In tabulating the scores the teacher finds that they are distributed over approximately the same range as the intelligence quotients for the first-grade pupils, discussed above. Assuming the same sort of rating, she gets the following distribution of scores:

No.	RANGE OF SCORES	CLASSIFICATION
3	134-171.....	Very superior
8	106-125.....	Superior
18	71- 97.....	Normal
10	51- 66.....	Dull
1	32.....	Borderline

Such a classification is highly theoretical, since it cannot be justified on the basis of raw scores, due to the factors affecting performance given below. The same is true of the *I.Q.* derived from mental-age equivalents to raw scores. The Terman Test provides for finding the *I.Q.* by dividing the mental-age equivalent in years and months by the chronological age in years and months, disregarding chronological ages above 16 years. This is a convenient device for use in comparing mental-ability ratings, but the *I.Q.* so determined is not to be regarded as a true *I.Q.* The above table is given for the sole purpose of showing similarity in distributions in different grades when mental-ability tests are used.

Factors Affecting Performance.—Pintner lists the factors affecting performance on mental-ability tests as follows: blindness, deafness, crippled condition, nasal obstruction, and starvation; language difficulties; home environment; and amount of schooling. Added to these should be the negative influences of distractions, bad lighting, and poor ventilation.

Use of Mental-Achievement Tests.—The mental-ability test, like the essay examination, is insufficient when used alone. It gives information only on *how much* the child has profited from his learning. There is need, therefore, in all grades and in all subjects, for tests which will show in *what specific ways* the child has profited. The achievement test does this and the ultimate goal is to determine the child's educational quotient to go with his intelligence quotient.

The Battery Test.—To secure the educational quotient (*E.Q.*), the teacher must choose a battery test—one made up of several tests over the various school subjects. There are such tests for use in any grade and they usually afford pro-

cedures for computing educational quotients. In the use of the Stanford Achievement Test, for example, educational ages may be found for each of the school subjects, and the educational quotient may be determined by dividing the composite educational age by the child's actual age.

The Stanford Achievement Test.—The Stanford Achievement Test was designed for grades 2 to 8. The tests consist of a Primary Examination and an Advanced Examination.

The Primary Examination, for grades 2 and 3, includes tests in arithmetic, reading, and spelling.

The Advanced Examination, for grades 4 to 8, includes tests in arithmetic, reading, spelling, science information, history, and literature.

Elementary subjects not included are: handwriting, hygiene, geography, domestic science, and manual arts. They are omitted because they are too time-consuming and unwieldy, because in many schools they are not taught, and because when they are taught it is only for a brief period.

The total working time for the Primary Examination is approximately 60 minutes, for the Advanced Examination approximately 125 minutes. The range in educational quotients usually approximates the range in intelligence quotients.

Use of the New-Type Test.—Whether or not mental-ability and battery-achievement tests are used the teacher will find it profitable to employ new-type tests in the various subject fields. The new-type test is modelled upon the single tests of the battery, and appears in a number of different forms. Examples follow:

Completion Test

Across the from Rock Island, Illinois, is
the city of , Iowa

Multiple Choice

The President of the United States during the
World War was: Harding, Roosevelt, Wilson,
Taft, Coolidge

True-False

Snow never falls on the Pacific Coast of the United
States. true false

Best Answer

We use textbooks in schools:
To make the children work
To lessen the work of teachers
To guide the class discussion

Matching Test

Indicate the correct author by placing the appropriate
number of the author in the parentheses next the book:

Treasure Island	()	(1)	Eliot
Roughing It	()	(2)	Churchill
Ivanhoe	()	(3)	Stevenson
Ben Hur	()	(4)	Jackson
Silas Marner	()	(5)	Twain
Ramona	()	(6)	Dickens
Dombey and Son	()	(7)	Wallace
The Crisis	()	(8)	Scott

Identification Test

Identify, among the following names, three American
statesmen:

Chamberlain, Disraeli, Hughes, Grey, Hay, Bismarck,
Robespierre, Franklin, Asquith

The new-type test has a distinct advantage in that it may be prepared by the teacher for any subject field. Further, it is specifically objective, is easy to give, and easy to score. It affords by itself, however, no satisfactory devices for measuring mental growth and is best used as but one of a number of measures.

Use of Many Measures.—In considering the measurement of the results of teaching the teacher should be guided by the following rules:

1. *Secure as full a measure of mental growth as possible.*
2. *Use any kind of a test that will serve as a guide in raising the average of the child's behavior.*
3. *Find the child's intelligence quotient and his educational quotient.*
4. *Use the new-type test to measure the child's grasp of subject-matter.*
5. *Use the old-type test to measure the child's progress in organizing his thinking.*
6. *Take plenty of time to prepare examinations, to mark the papers, and to evaluate the results.*

QUESTIONS AND PROBLEMS

1. Into what three groups are the feeble-minded divided?
2. What are the characteristics of the definitely superior?
3. What is meant by the terms *delinquency* and *instability*?
4. Enumerate twelve types of disordered mentality and indicate which of these may prove to be problems of the school.
5. What are the three conditions for normality as set up by Burnham?

6. What two conditions are necessary if mental growth is to be constant?

7. At what mental levels is growth the least constant? Why?

8. Taking the various theories on the upper limits of mental growth, upon what age limit shall we decide? Why?

9. What is meant by horizontal growth? Does it have any limits?

10. What is James' theory on the mental growth of adults?

11. Likewise, what is Thorndike's theory?

12. How are the two theories alike and how do they differ?

13. What problems for the school are presented by mental growth or its absence?

14. What is the fundamental test of mentality?

15. What are the four chief objections to the old-type examination?

16. By what formula is the *I.Q.* found? Illustrate.

17. What are the time allowances for the Stanford-Binet Scale?

18. With relation to classification, what are the norms for the Stanford-Binet Scale?

19. Why is the group test never so reliable as the individual test?

20. Outline the preparations necessary before undertaking to give a group test.

21. Why is the *I.Q.* from a group test not so reliable as the *I.Q.* from an individual test?

22. What are the chief factors affecting performance on mental-ability tests?

23. Distinguish between mental ability and mental achievement.

24. What are the advantages and disadvantages of the new-type test?

25. By using the six forms of new-type tests prepare a set of questions over some subject of your own choosing.

26. Give the rules that should guide the teacher in considering measurement of ability and achievement.

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CHAPTER X

Providing for Individual Differences

In discussing sense-perception we pointed out that, due to imperfections in the structure of the eye and ear, we differ greatly in visual and auditory acuity ; no two of us see and hear with exactly the same degree of keenness ; and this is true also of our other senses in their respective functions. There are similar differences in capacity for almost all other types of psychological activity✓

✓ THE PSYCHOLOGY OF INDIVIDUAL DIFFERENCES

Although we find disparity in the number and names of factors which influence differentiation, most psychological authorities are agreed that the fundamental sources of differences among individuals are:

✓(1) *Inheritance*, under which are to be considered differences due to near ancestry, such as physical resemblances and mental traits, and differences due to remote ancestry, such as racial peculiarities in behavior.

┘ (2) *Environment*, under which are to be considered differences produced by advantage or disadvantage in physical and social surroundings, differences not only in achievement but in inborn abilities.

(3) *Maturity*, which is to be considered as inner growth—growth which, as Thorndike states it, causes one individual to differ year by year from his former self, irrespective of all training.

Physical Differences.—In any unselected group of a given age large individual differences are found for any physical trait measured. (Eye-color, hair-color, number of blood corpuscles, height, weight, strength, lung capacity, length of arm, size of feet, and shape of head are all to be included. Besides these are the differences produced by certain defects, such as stuttering or lisping, and differences due to conditions

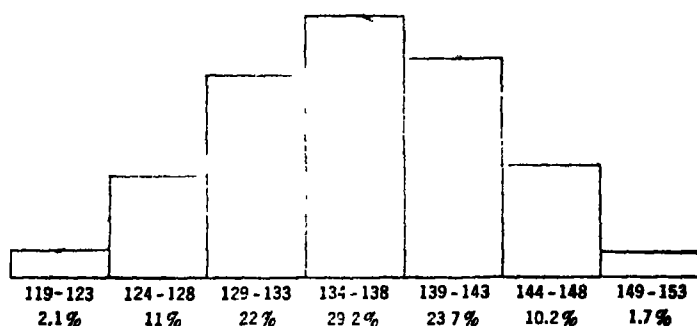


FIG 14

Individual differences in height among 236 boys between 9½ and 10½ years of age. (Baldwin.)

of health, such as anaemia, over-sensitiveness, and extreme nervousness.

While most of these conditions are due to inheritance, some of them are influenced by environment. For instance, one's height or weight, in its earlier stages of growth, is often partly determined by lack of adequate food, fresh air, and sunshine. Again, conditions which affect the glands, such as in thyroid disturbance, while in instances due to inheritance, are sometimes due to environmental causes.

The rate of individual physical growth is measured by dentition, ossification of the wrist bones, and the appearance of pubescence. In interpreting the results the term *anatom-*

ical age is used to indicate the degree of physical development average for a given chronological age.

Woodrow points out that variation in dentition is illustrated in the fact that the upper central incisors sometimes appear as early as the age of five years and three months, and sometimes as late as nine years and nine months—a range of four and one-half years.

Prescott shows that, among individuals of the same chronological age (six-year-old boys), there is a range in carpal development of at least five and one-half years.

An equivalent range is found in stages of pubescence. Crampton reports that, among 4,800 boys, pubescence occurred in some as early as twelve and one-half years, in others as late as seventeen and one-half years—a range of five years; and Hollingworth states that, for white girls in the United States, the first period of menstruation ranges from nine years to fourteen and one-half, with an occasional case at twenty years or older.

Imagery Differences.—Galton, in an early study of imagery, concluded that there is an absence of flexibility in the mental imagery of most persons. The first image of any scene, he says, holds its place tenaciously despite subsequent need of correction. To see an object often in many positions combines the memories and confuses them so that, for instance, one is less able to visualize the features of intimate friends than those of persons seen but once. Variation appears, however, in the fact that a few persons have complete mastery over their mental images; they can make them stand up, sit down, or run at will.

The tendency among normal persons is to differ in the description of imagery. Woodworth says that perhaps we differ more in this than in any other respect. We scarcely

credit each other's testimony, each of us being so certain of what he has seen that others must conclude to a very real difference in imagery.

We pointed out earlier that there are but two types of imagery adequately distinguished—~~visual~~ and ~~auditory~~. Differences in one or the other of these types are due partly to heredity and partly to habits of observation and attention, so that we are sure to differ in imagery as a result of learning. Some persons lack imagery in reading, for example, or in reasoning, or in visualizing for purposes of creating something.

(Age has much to do with differences in imagery. Children differ from adults in kinds, vividness, and number of images. Visual imagery in the child is contrasted with verbal imagery in the adult. However, neither the child nor the adult can be classified according to kinds of imagery; these vary in recalling different kinds of material. Nor is imagery differentiated by degree of mentality. Terman states that feeble-minded children, unless of very low grade, do not differ markedly in type of imagery from normal children.

As for memory images, at all age levels there are all degrees of differences in the ability to remember names, faces, words, sounds, colors, and rhythms. Some are differences in memory ability; others are due to interest, purpose, health, and education. ~*~*~*~*

Differences in imagery may be illustrated by use of a symbol. A public speaker, let us say, incidentally refers to an unnamed hero. To each member of the audience may appear a different image; to the younger members: a football hero; a boy who is not afraid of the girls; a movie actor; a strong swimmer; a fire-fighter; or a character in fiction or song; to the older members: an arctic explorer; a dauntless airman; one who is able to speak in public; or the father of fifteen

children. The only limit to the number of immediate images is the number of persons in the group—an image for each, colored by his past experience and present interest.

These differences in imagery are sure to produce differences in selection of subject-matter for thought, for the reason that they produce differences in retention, in feelings and emotions, and in the language we use.

✓ **Suggestibility Differences.**—There are, according to recognized authorities, two types of learners: (1) those who acquire habits by the slow process of repetition; and (2) those who acquire many of their habits by shock or vigorous initiation. The second group is largely comprised of those susceptible to suggestion.

Great differences exist in our responses to single suggesting agencies. In certain forms of insanity, for instance, the patient is the least suggestible of all persons because he is the victim of one fixed idea, one which cannot be shaken. To find differences in degrees of suggestibility we have only to follow through from feeble-mindedness to high intelligence. The ignorant person, for instance, is suggestible along some lines because he has formed habits of conforming, and highly suggestible along a few because of lack of education. The intelligent person, because of his powers of adaptation—growing out of the habit of forming habits—is highly suggestible in the sense of being open to a great variety of suggestions. The educated person whose education has not functioned in the development of intelligence is, in the same sense, the most highly suggestible of all; he is even more fearful, for example, than the ignorant person, whose very ignorance often makes him immune to fear.

✓ **Temperament Differences.**—Environment is sure to create differences in the single reactions of any individual,

and change is the most important factor in environment. Because one's environment changes constantly, from minute to minute, hour to hour, day to day, and year to year, the individual changes with it. Even if it remained the same he would change, because of inherent drives to activity. He is everlastingly reacting, responding to something and, when his environment seems to remain relatively constant, he resists against monotony.

Broadly speaking, there are some persons who do not seem to change greatly. They are the same from day to day and under all conditions; but the changes taking place in them are on such a large scale that alteration is almost imperceptible. In such cases strength of habit plays a strong role—habit, for instance, of suppressing mental imagery through thinking in abstract terms, or habit of inhibiting the emotions so that they are not given outward expression.

(Sooner or later the individual resorts to introspection—stands aside, as it were, and watches himself go by; and introspection produces great differences in individuals.) Some become subject to differing degrees of introversion and some to differing degrees of extroversion. The introvert and the extrovert may be described as follows:

- ✓ 1. The *introvert* is the individual who finds satisfaction or happiness within himself. To use the words of Thomson, he creates a world within, is a thinker, perchance a dreamer; but if he does turn to action his powers of thought often make that action of far-reaching importance.
- ✓ 2. The *extrovert* is the individual who finds satisfaction or happiness outside himself. He looks outward for the outlets of his energy. He is a man of action. He lives for the world rather than for himself.

Even among young children marked individual differences in introversion and extroversion exist. According to Mar-

ston, children as young as two or three have already developed characteristic attitudes of introversion and extroversion toward certain significant situations.

Warren believes that one may develop feelings or tones that lead to specific temperaments, but, given to much introspection, he may go even further; he may develop complexes. A complex, says Hart, is a system of emotionally-toned ideas. The hobby, for instance, is a complex, and complexes may be of all kinds, the accompanying emotional tones being pleasant or painful, very intense or comparatively weak.

The *inferiority complex* develops in the way indicated. It starts with a feeling of inferiority. The individual, conscious of the fact that he has some physical deficiency, such as imperfect eyes, a weak stomach, or kindred ailments, or is subject to suppressions that arise from poor environment, begins to feel inferior to the persons about him. This feeling in itself, when we follow Hart's definition, may be described as a complex; one's thought and expression may be altogether directed by the feeling-tone.

However, as the psychoanalysts define complex, other elements enter in. The individual, conscious of and subject to such conditions as those listed, develops strong tendencies toward selfishness and egotism—these to cover up his weaknesses. The combination (a feeling of inferiority with outward pretense of superiority) comprises the inferiority complex.

Mental Differences.—Mental differences, represented in intelligence and educational quotients, tend to group themselves into relatively fixed percentage levels. When the scores of a large number of persons measured by the same instrument are put in the form of a diagram the result is the *theoretical probability curve*, sometimes called the normal

curve of probability. The shape of the curve indicates the differences of distribution in position. For example, in the *normal* curve the measures pile up at the center of the distribution; in the *skewed* curve they pile up at either end; and in the *bi-modal* curve they pile up at both ends. Where unselected groups are concerned the smoothness of the curve shows how well the instrument used brings out the abilities or traits measured

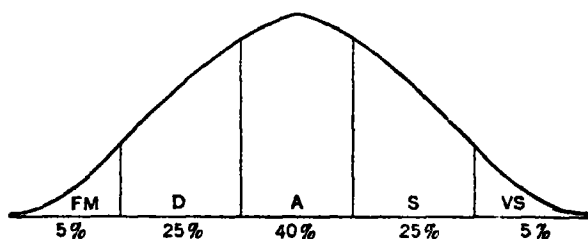


FIG. 15

Showing normal distribution of intelligence quotients of 3,000 first-grade children. The letters within the figure represent levels of intelligence, and the numbers below show the percentage of the group at each level. Thus, 5 per cent are very superior in intelligence, 25 per cent superior, 40 per cent average, 25 per cent dull and 5 per cent feeble-minded.

The tendency of a large number of measures to pile up around the average is more easily seen if we take the performances of one person only. If we measure a large number of an individual's performances along one line, such as courteous action, and plot the results we find that most frequently he has approached his average, while excellent and poor performance (for him) will have been shaded off equally toward the lower percentages.

Among children real differences in mental ability are to be found, says Terman, in power of comprehension, abstraction, ability to direct thought, associative processes, information possessed, and spontaneity of attention, and the three general ways in which they vary from each other, says C.

are: (1) the direction of development; (2) the degree or amount of development; and (3) diversification of organization.) The second of these ways needs no explanation; we covered that fully in speaking of vertical and horizontal growth. The first (direction of development) Carr explains by saying that an individual brought up too exclusively in an environment of art may develop into an aesthete, or, in an environment of sports, may develop into a professional athlete. The third (diversification) refers to organization of one's experiences, persons differing in this even when the background of experience, both as to kind and amount, has been the same. ✓

Sex Differences.—A great many studies have been made of sex differences and the general findings only can be given here:

(1) *Physical Differences.* At the same age and up until puberty boys are more advanced than girls in height, weight, dentition, and physiological maturity, while at the ages 11-12-13 the situation is just reversed. The brain of the female is smaller than that of the male but is heavier in proportion to the weight of the body. Simple reflexes and the heart-beat are faster in women. Men have larger muscles and excel women in physical strength. ✓

(2) *Sensory-Trait Differences.* There are no real differences between the two sexes in visual and auditory acuity and discrimination. Women excel slightly in discriminating colors and in perception and men judge differences in weight a little better.

(3) *Mental Differences.* Boys excel in number and space concepts, in arithmetical reasoning, and in general information. Girls excel in mental-age up to fourteen, in memory, in vocabulary, and in the school subjects of spelling, reading,

writing, and composition. There are no real differences in drawing.

(4) *Emotional Differences*. Men are more interested in mechanical things, business relations, activities, and general and abstract matters. Women are more interested in persons and personal problems. Women are more religious and more hypnotizable than men. Starbuck states that six times as many women as men are converted at regular church services, and Ellis points out that in every hypnotic clinic women are in a great majority and that, throughout the Middle Ages, there were fifty times more witches than wizards. Today, Ellis says, women make better mediums than men.

Kin Differences.—Many studies have been carried on to prove that ability runs in families. Some of the more important of the recent studies are:

(1) *Terman's Study of Genius*. Of 644 children studied by Terman, two were contributed by each of seventy-three families, and three or more by each of nine families. Related to this group were nearly one-fourth of the members of the Hall of Fame, while many of the parents or near relatives held major political offices, important business positions, college presidencies and professorships.

(2) *Thorndike's Study of Siblings*. In a study of 1,000 siblings, all high school pupils, Thorndike found a marked correlation between sibling scores on a general ability test. Pearson had found that the physical correlation between siblings is .52 and Thorndike concludes that the effect of environment, i.e., the rearing of brothers and sisters in the same home, is to raise the correlation about eight points, the mental correlation, as found by Thorndike being .60.

(3) *Newman's Study of Twins*. Newman's study con-

siders two types of twins—identical and fraternal. Identical twins are believed to be born from a single egg-cell that

TABLE II.—Showing amount of correlation in several variables for identical twins and fraternal twins (Holzinger). All correlations are positive and each is to be considered from the viewpoint of its variation from +1.00 (perfect correlation). The total numbers of finger ridges on both hands were derived from palm prints, the separate subject-matter measurements and educational ages were taken from the Stanford Achievement Tests; and emotional stability was arrived at through use of the Woodworth-Mathews questionnaire on nervous habits.

TABLE OF CORRELATIONS (AGE CONSTANT)

VARIABLE	IDENTICAL (50 PAIRS)	FRATERNAL (52 PAIRS)
Standing height	.93	.65
Weight	.92	.63
Head length	.91	.58
Total finger ridges	.97	.46
Binet mental-age	.86	.60
Binet I Q	.88	.63
Word meaning	.86	.56
Arithmetic	.73	.69
Nature study	.77	.65
History and literature	.82	.67
Spelling	.87	.73
Educational age	.89	.70
Emotional stability	.56	.37
Motor (tapping)	.69	.38

becomes divided at a very early stage. Such twins are always of the same sex and are remarkably alike. Fraternal twins

are believed to be born from separate egg-cells that merely happen to be fertilized at the same time. These twins may be either of the same or opposite sexes and are no more alike than ordinary brothers or ordinary sisters.

Holzinger, who took physical and psychological measurements of fifty pairs of identical twins as compared with fifty-two pairs of fraternal twins, states that: (1) for identical twins environmental factors have produced differences between the members of the pairs, and (2) for fraternal twins differences between these pairs are in part due to heredity. As a general conclusion Holzinger states that nature is about equally effective with nurture in producing average twin differences. *NA*

(4) *Freeman's Study of Foster Children* Freeman has been engaged in a study of foster children to determine the amount of influence of environment upon the intelligence of children. Foster children were selected because their foster homes are usually superior to their hereditary homes.

Freeman has found that children tested on being placed in foster homes gain, after about four years of residence, about 7 points in *I.Q.* when retested. Those placed in superior homes gain about 10 points and those placed in below-average homes about 5 points.

The results of a similar study carried on by Burks and Terman are about the same, the gain in *I.Q.*, when children are placed in good foster homes, is about 5 or 6 points.

(5) *Thurstone's Study of Parent Age* Thurstone has carried on an extensive study of the intelligence of children with reference to the ages of the parents and the order of birth of the children. He concludes that, on the whole, later born children tend to be on the average brighter than the first born and that the rise in intelligence with order of birth seems to continue as far as the eighth born child. Thurstone points out a number of possible explanations:

(a) More adequate maternal experience in rearing later children.

(b) Progressive improvement in economic status of families.

(c) More favorable social opportunities for the later born.

(d) Some physiological effect in the mother favoring later born.

Steckel, as a result of a similar study, concludes that, in general, children of more mature parents will measure higher in intelligence than those of very young parents.

Racial Differences.—Since somewhat more than one hundred studies of racial differences have been made, only the nature of the findings in general can be presented here, findings which represent intelligence ratings.

The Negro measures consistently below the white in mental ability. There is some over-lapping of scores, some Negroes scoring higher than the average for whites. There are small and unreliable differences between the two races in temperamental traits.

The American Indian and the Mexican generally score lower than whites on tests of mental ability. The Indian's inferiority in mental tests is due to temperament resulting from a different attitude toward life and different ideas as to what is important and valuable. Indians are slower than the whites but more accurate.

Japanese and Chinese, given equal opportunity for education and American contacts, are little if at all inferior to the whites.

Italian and Polish children born in the United States test consistently below native-born whites.

Jewish children test slightly below the average, but 10 per cent of our gifted children are of Jewish extraction.

Generally speaking, racial differences are largely differences in language, schooling, customs, and backgrounds—social, economic, and geographic.

INDIVIDUAL DIFFERENCES AND EDUCATION

(Children differ from each other in an almost endless variety of ways) and the results of intelligence tests show that they differ as much at one level as at another. Terman states that the distribution of *I Q.*'s is practically the same at each age from five to fourteen and that six-year-olds differ from one another fully as much as do fourteen-year-olds. Outside the field of intelligence testing many differential measurements have been made and we find great variation in such traits as: courage, conscientiousness, social adaptability, vanity, cheerfulness, sense of humor, evenness of temper, and ability to sustain attention.)

The results of the differential measurement of any trait approximate the normal curve of probability. The curve indicates that about forty per cent of any unselected group will vary but slightly from the average, while fifty per cent will vary in greater measure from the average, with the remaining ten per cent about equally divided and varying from normal in great extremes. This means that provision must be made for differences along a number of important lines, not that all children may be "cut from the same pattern" but that each child may be given equity of opportunity to learn.

Physical Differences.—In an earlier chapter we stressed the need for medical attention for children with physical defects and also the need for careful oversight of incipient and developing cases of malnutrition. In the larger schools much is being done along these lines and in some cities individual

children, because of their physical condition, are placed in special groups.

Before special health groups are organized a general health survey is carried on, a physical examination for each child is given by the school doctor and school nurse. The survey includes: tests of vision and hearing, tests of weight and height and cardiac conditions, and determination of whether physical deformities require placement in special room or school for crippled children. Undernourished, anaemic, and malnourished children are cared for in special open-air or open-window rooms and provided with milk and special lunches. About twenty-five per cent of the crippled children require hospital care and the remainder are provided with corrective exercises or special prevocational training in special classes or schools.

Children with speech disorders have difficulty with such school subjects as spelling and reading. These also are given attention by the physician and special-class teacher.

[Smaller schools cannot establish special classes but a *health survey should be made at the beginning of each school year and everything possible done to improve the physical condition of each below-average child*].

Imagery, Suggestibility, and Temperament Differences.

—In providing for differences in imagery the teacher's efforts, as we have indicated at different points, are to be centered in the building of better images. *[Give the child the clear idea and interpret sensations and define learning situations so accurately that he will get as nearly as possible the same meanings as other children.]*

Differing degrees of suggestibility demand that the teacher employ different agencies of suggestion and exercise caution as to the right moments for their use. Some children

are suggestible for emotional reasons and others from intellectual causes. With the latter in mind we may set up the following general rules:

1. *Use suggestion as preparation.* For instance, suggest to the child that he is sure to get satisfaction from work well done and, when he has once accomplished a difficult task; suggest that he repeat, even improve. The tenor of teaching suggestion is largely along the line of improvement. Most of the time it is in the direction of encouragement, but sometimes it is in the direction of discouragement, in order that greater effort toward improvement will be made.

2. *Be sure that the child with a meager background of training is ready for suggestion.* This type of child is highly suggestible along a few lines, provided, in the words of Myers, the suggestion accords with his whole mental and physical attitude. He must be in readiness for the suggestion. He is not open to shock. To be effective the suggestion must "sink in."

3. *Feel free to use suggestion with the mentally alert child at any time.* This type of child is quick to make the problems of the school his own problems. He has formed a habit of forming habits and although, when thinking critically, he will sometimes throw off suggestion, he is likely at any moment to recall it and act upon it in his eagerness to learn.

4. *Remember that the educated child who is short in common sense is most highly suggestible of all.* Where education has not functioned in the development of intelligence it gets in the way of courage and cheerfulness. Pains must be taken therefore to rob suggestion of its strength with this type of child. Suggestion, where used purposely, must be elaborated upon in great detail.

5. *Watch for the right moment for the appropriate suggesting agency.* Periods of suggestibility alternate with in-

tervals of resistance. If the suggestion is to be effective it must be made during a period in which the child is open to it.

[So far as temperament is concerned the problem is centered in the redirection of extreme defects, such as excessive nervousness. Suggestion finds a ready place in the treatment of nervous children] and for handling the nervous child we have the following rules:

1. *In vite his attention to things which to do not make him nervous.* \

2. *By suggestion cause him to feel that he is getting better.*

3. *See that he gets rest, plenty of sleep, good food, and outdoor life.*

4. *Teach him to laugh at his dilemmas.*

5. *Overcome his fears by quiet reassurance and by reasoned demonstration that there is nothing to fear.*

6. *Banish worry by presenting the optimistic approach to each problem.*

7. *Give the child tasks he likes to perform or create likes for those he must perform.*

*8. *Build up self-control by exercising quiet control over his activities.*

9. *Lessen his feeling of inferiority by rewarding him appropriately for his successes.*

Mental Differences. [Many schemes have been evolved to provide for differences among school children in mental ability and mental achievement, each of which may be classified under one or the other of two heads: (1) traditional organization with adjusted instruction; and (2) adjusted instruction with class organization subordinated. Under the first head come:

j (1) *The Batavia Plan*, in which an extra teacher was assigned to each room to coach and encourage laggards.

(2) *The Gary Plan*, a system which permits double time on subjects in which children are slow.

(3) *The Chicago University Plan*, an intensive study of children who meet unusual difficulties.

(4) *The Ability-Grouping Plan*, which provides for rapid promotion, enriched curriculum, or special classes for the atypical.

(5) *Differentiated-Assignment Plan*, which provides extra credit for extra work and high marks for additional work.

Under the second head come:

(1) *The Dalton Plan*, which divides the subject-matter into a series of related jobs, each of which can be completed in a month.

(2) *The Winnetka Plan*, in which a half-day is devoted to group instruction and a half-day to individual work.

(3) *The Rural School Plan*, in which the day is divided into four long periods, most children studying individually under supervision while others are doing class work with the teacher.

Of these various plans the ability-grouping has had the widest vogue. As worked out in some cities it has provided for a five-track, a four-track, or a three-track plan, each track having a special course of study and differences in methods of instruction with segregation based on mental-ability ratings. (For instance, children with low mentality are sent to *development* classes; children with good native ability but who are failing in their work are sent to *adjustment* classes; superior children are sent to *opportunity* classes; and normal children are divided into three groups within a class—slow, normal, and fast, thus providing for enrichment of the course of study and rapid promotion for the superior group.)

While it has been found that pupils do better in homogeneous than in heterogeneous groups, there is no evidence that

elimination is reduced by homogeneous grouping. (Despite that fact more and more schools have adopted the ability-grouping plan, probably because a system of individualized instruction is too costly. Where ability grouping is introduced what are the best criteria for classification?

The advantages of grouping on the basis of mental ability are these:

(1) It permits the location and classification of children of low mentality for whom may be worked out content and method suited to their training.

(2) It permits the location and classification of superior children who may be prepared in homogeneous groups for achievement in literature, science, industry, and government.

The disadvantages of grouping on the basis of mental ability are as follows:

(1) The bright pupils may feel superior and the mediocre or dull pupils inferior.

(2) If no change is made in the curriculum the bright pupils do not always gain through segregation.

(3) The slower pupils may actually lose when the brighter pupils are withdrawn

(4) The range of ability in homogeneous sections may soon come to be much greater than the difference between groups.

(5) Grouping is done on the basis of degree of intelligence rather than on kind of intelligence.

Precisely the same advantages and disadvantages exist if grouping is based on the results of achievement tests. The standardized subject-test may not test the child over the material in which he has been instructed and is therefore not always a complete measure of achievement. (Where the standardized subject-test is used as a basis for grouping it should

be supplemented by new-type tests prepared by the teacher, tests over the actual material presented.

Since there is but slight assurance that, because a child does well or poorly on either or both types of mental tests, he will succeed or fail in the work of the classroom, there is strong argument for the use of a third basis for classification, that of actual standing in school work from month to month. The child's standing is ordinarily arrived at through his record in class recitation and in his reaction to the old-type or essay examination

In having classification on mental ability, mental achievement, and actual standing we have three criteria arrived at through measurement. If all three are to be used a composite score for each child should be calculated before classification takes place. There should be no thought of using the separate records interchangeably. When pupils are grouped by intelligence quotients and then regrouped by scholarship records there is a displacement of approximately fifty per cent.

In the ideal scheme of classification some attention should be given to anatomical age. While the correlation between mental age and anatomical development is not high it still is constant and extreme variations in anatomical development must be taken into account. That is, a child should not be advanced to a higher group or to more difficult work unless this can be done without injury to health.

Some consideration too must be given to the child's social maturity. Social maturity is acquired in such a variety of ways that it is sure to be a problem in classification. Social adjustment can often be made by giving special promotions but the individual pupil must be kept in mind and assigned to such activities as will correct deficiencies not only in pre-

vious training and social background but in present social habits or attitudes.

[It will be seen that, whether a school system adopts a plan for grouping or a plan for individualized instruction, the ultimate goal is to secure maximum development of the abilities of each child. With that in mind the following rules may be set up:

1. *If the group plan is followed it should not be based upon any single factor but upon several. Ability and achievement tests and scholarship records should be used and no shifting from one group to another should take place without due regard to the child's anatomical and social maturity.*

2. *Diagnoses of individual difficulties should be made from the results of testing and remedies provided through intensive study of individual problems.*

3. *Even where the traditional group method is employed effort should be made to iron out some of the individual differences in learning. For the slower children this may be done by: giving individual attention during study periods and after school; by finding their special interests and giving special home work; by calling on them more frequently; and by letting them lead in something. For the brighter children it may be done by: giving them more work, special work, and harder work; by finding out their special interests; by giving them extra reading and encouraging library work; and by teaching them the responsibilities of leadership.]*

Although mental differences distribute themselves according to the normal curve of probability, teachers are not justified in using the curve as a basis for marking unless they are willing to make the work so difficult that the real worth and ability of each child is adequately tested. Even then there should be no thought of rigidity. The law of probability

ceases to be a law of probability when it becomes a law of certainty.

Sex Differences.—Since the physical and mental differences between the sexes are made inconsiderable by certain strengths within each sex offsetting certain weaknesses, no provisions of major importance for differences in sex are necessary. [Here the teacher needs but keep in mind that: girls tend to live more by intuition and boys by reason; due to past experience the two sexes differ in mental imagery; and girls excel in the content subjects and boys in the tool subjects. ¶ To equalize sex differences therefore more stress should be put upon the content subjects for boys and upon the tool subjects for girls, with care not to defeat creative thinking in any natural direction.

Kin Differences.—Differences represented by kinship are beyond the power of the teacher to redirect but she may have opportunity to aid in the improvement of a child's home environment. Where such opportunity arises she can do one of two things: *encourage parents to better home conditions so that the child will be helped in his learning or, in cases where adoption is anticipated, help the child find a better home than the one in which he has been reared.*]

Racial Differences.—[So far as customs and socio-geographic backgrounds are concerned, the school in itself can do nothing immediate in ironing out racial differences; generations of time and experience must take care of that; but the teacher is in a position to bring about improvement in language-usage, in culture, in racial attitude, and in economic condition.

¶ The chief and most urgent need is to overcome language

handicaps. The rate of growth in mental ability is largely determined by the rate of growth in language learning. The teacher should therefore *stimulate an interest in language learning and a willingness to work at it until every ounce of meaning is exacted.*

The second need is to help the child of another race meet the exacting demands of our system of educational training. His difficulty in learning is due more to binding customs and traditions than to inherent traits. In helping him the teacher must *first create a sympathetic attitude toward him, by looking upon his educational training as insurance for his future as well as insurance for our own social order, then gradually inculcate new moral outlooks and attitudes by presenting learning situations with greater patience and with greater detail.*

The third need is to help improve the economic status. The teacher does this indirectly by proving beyond doubt that education will better economic status. She should *make a definite appeal to economic interests by showing the child that education will not only enable him to better his own condition but that of his family as well.*

QUESTIONS AND PROBLEMS

- ✓ 1. What are the three fundamental sources of differences in individuals?
2. What are the individual physical differences to be found in any unselected group?
3. How are the differences in the rate of physical growth measured?
4. Show by example how individuals differ in imagery.
5. Show how persons of different mental levels differ in degree of suggestibility.

6. What is meant by the terms *introvert* and *extrovert*?
7. Explain the term *inferiority complex* as used by the psychoanalysts.
8. Under what conditions might one have a *superiority complex*?
9. In Chapter IX are given two distributions: one for *I.Q.'s* of first-grade children and one for mental-ability scores of eighth-grade children. Plot a curve for each and superimpose them upon the curve of probability.
10. What are the significant physical and mental differences between the sexes?
11. What evidence have we that ability runs in families?
12. What did Thorndike conclude as a result of his study of siblings?
13. In his study of twins what has Newman found out about the relative effects of nature and nurture?
14. In his study of foster children what conclusions has Freeman reached as to the effects of environment?
15. What relationship does there seem to be between the age of parents and the intelligence of their offspring?
16. In mental ability what differences exist between whites and: Negroes, Indians, Mexicans, Japanese, and Chinese?
17. What can be done by the school to provide for individual physical differences?
18. How may differences in imagery be most nearly equalized?
19. Give five rules for the use of suggestion by the teacher.
20. Give nine rules for the treatment of extremely nervous children.
21. What is meant by ability grouping of school children?
22. Why should school children not be grouped on the basis of mental ability alone?
23. Under the traditional group method how can the teacher iron out some of the differences in learning?
24. What abuses may come from using the curve of probability as a guide in marking children?
25. What provisions should be made for sex differences in learning?

26. Is there anything the teacher can do to iron out kin differences?

27. What are the three steps to be taken in ironing out racial differences?

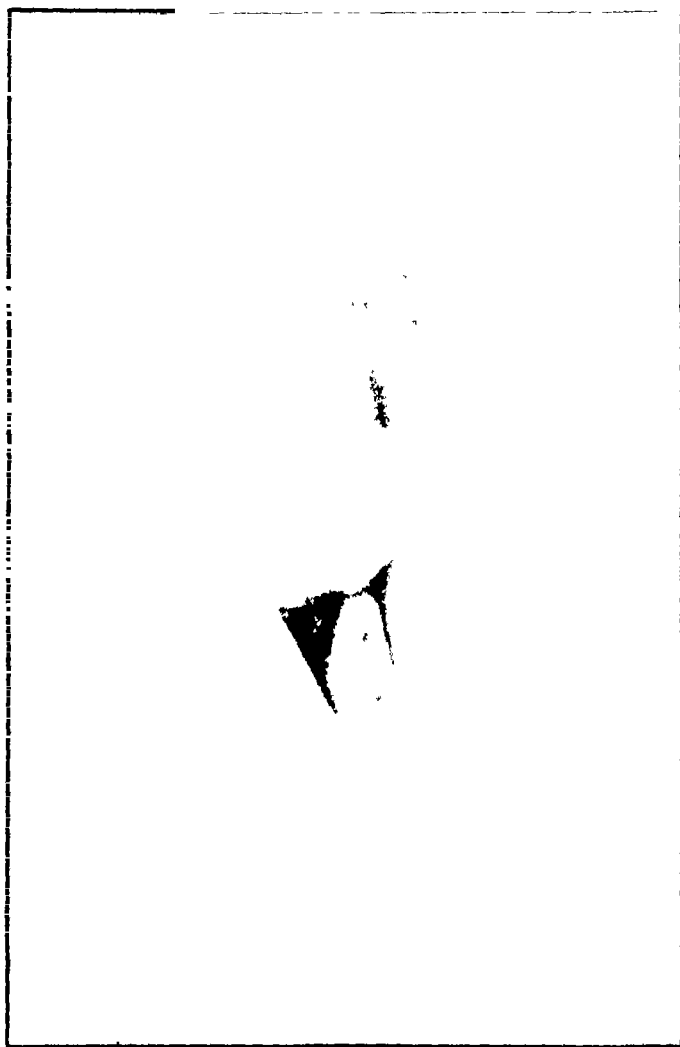
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LEWIS M. Terman

CHAPTER XI

Character and Its Development

We have put so much emphasis upon learning to think and upon individual differences in thinking that it is well in this chapter to indicate not only the general outcomes of thinking but the ways in which the improvement of those outcomes may be assured.

[To think, says James, is a moral act, and, from a popular standpoint, a man's moral standing or rating, says Warren, is his character. Thinking—a matter of giving expression to one's impressions—is therefore sure to build up in the individual a combination of traits which, if we do not admit the presence of a general factor, may be called *character*. But what is character from a strictly psychological point of view?]

THE PSYCHOLOGY OF CHARACTER

Differences in psychological definitions of character are not so much differences in meaning as differences in terminology. When these definitions have been resolved into a composite definition we may say that *character is the individual's total customary reaction to his environment*. Such a definition implies that each individual possesses character in some degree and kind. Our problem here is to show how it is built.

Habit and Character.—Character has its roots in the individual's instinctive equipment and, as we know, the strength of inherited tendencies is sure to form paths of least resis-

tance in the nervous system. These paths of least resistance provide routine ways for performing particular tasks and this implies that, so far as character is concerned, one's total customary reaction may be nothing more or less than a bundle of habit reactions.

Objection has been taken to this view on the ground that it leaves the individual a slave to habit—the individual merely recognizes an element in a situation confronting him and, through readiness of synaptic bonds, responds automatically; he makes no choice between possible responses and confronts no problems of conduct.

It can be shown though that habit can get into one's total reaction without consuming character or without serving as a permanent guide to conduct. The process of acquiring language habits is an illustration. As we have pointed out, the pronunciation a child gives to words is primarily a matter of imitation and his speech sounds, rate of speaking, and selection of words are largely determined by the amount of satisfaction or dissatisfaction derived from the use of sounds and words and their articulation. The results become well-formed language habits which may owe their presence to inherited tendencies and which pave the way for formation of more of like kind. Consequently the language the child employs becomes largely representative of what he really is—his character—and it not only helps to determine the nature of his environment but operates also in the acquisition of other character traits. The mere fact that the child may not be able to "express himself well" or that he chooses improper and inexact terms as symbols of meanings not infrequently shapes his whole career. (Some individuals never get on in the world because they are so often "misunderstood" when misunderstanding is due to nothing more than misjudgment of character because of poor language habits.)

Conscious States and Character.—Not all of one's character by any means is responsible for its growth to mechanical modes of reaction. They are but the forerunners of conscious states the outward expression of which give the individual his reputation and record. Character is what a person really is, his reputation is what he is thought to be, and his record is the total of his known action or inaction. His reputation and record are largely the outcomes of his perceptions, feelings, emotions, and ideas.

For instance, we not only differ greatly in the meanings we give to our sensory experiences but we are subject to many false perceptions—illusions of space, form, time, and appropriate setting. For these reasons we differ in the ability to discriminate, and one of the foundations of character is the ability to distinguish right from wrong and beautiful from ugly.

Again the direction of various lines of one's character development will change with the fluctuation of attention. This means that the individual often will attend to things which are debasing rather than ennobling.

Feeling functions in character formation through the three forms of self-consciousness. When one is unpleasantly self-conscious—shy, hesitant, anxious, ill at ease—he is aware of bodily or nervous processes which do not set him off in the right light. He is over-conscious of his appearance. When he is pleasantly self-conscious he swings to the other extreme and shows by his actions that he feels some superiority in appearance and ability. When he is efficiently self-conscious he strikes a balance between unpleasant and pleasant self-consciousness. He is self-confident because he feels that appearance and actions are appropriate but, at the same time, cautious that these conditions are not over-emphasized.

When one is led into wrong channels of behavior emotion

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is a natural consequence. In the large, the emotions of joy and anger cause him to throw off restraints while the emotions of fear and sorrow cause him to put them on again.

The powers of memory operate to check the individual's will or to strengthen it. To recall that he once had a reputation for goodness may inhibit one's resolution to be bad and may substitute a desire to react in right ways again. On the contrary, to remember experiences which yielded immediate though temporary satisfaction may return the individual to wrong reactions.

Levels of Conduct.—Habits and conscious states together serve to establish levels of conduct. McDougall distinguishes four such levels, or successive stages, each of which must be traversed by every individual before he can attain the next higher stage. The levels are:

- ✓(1) Instinctive behavior modified only by pains and pleasures incidentally experienced
- ✓(2) Instinctive behavior modified by the rewards and punishments of the social environment.
- ✓(3) Behavior controlled in the main by anticipation of social praise or blame.
- ✓(4) Behavior regulated by an ideal of conduct—one does the right thing regardless of praise or blame from his social environment.

Tests of Character Traits.—Mental-ability and mental-achievement tests, while revealing some of the results of instruction, do not measure such traits as morality, honesty, emotion, will, social adaptability, industry, perseverance, loyalty, cheerfulness, and interest—traits which go into the making of character. Test-makers have realized this and have devised tests for honesty, emotional reactions, tem-

perament, and social attitudes, testing components of character rather than a general factor. Some of these tests are judgment tests and some are behavior tests, the first measuring the child's reaction by his expression of judgment and the second requiring him to *do* something as an indication of his natural response.

The behavior tests, says Freeman, appear on the whole to be more satisfactory than the judgment tests. Among the well known behavior tests are those devised by Hartshorne and May.

The Hartshorne-May Tests.—Hartshorne and May devised tests of school honesty in which children in groups were required to.

- (1) Thread pencil mazes with eyes closed.
- (2) Do simple sums to reveal their speed.
- (3) Do similar sums with plenty of time to score results.
- (4) Take symbol substitution tests and score them.
- (5) Take work home to finish it but without help.

In their three different volumes on the results secured the authors set forth the following conclusions:

(1) Children from poorer and crowded sections of cities are lower in honesty than those more favorably reared.

(2) Dishonesty is not inherent.

(3) In children of approximately the same age, dishonesty is commoner to the lower levels of mentality than it is to the higher.

(4) In some schoolrooms honesty is the rule, in others, dishonesty; much depends upon the teacher and group morale.

(5) Some children, even after receiving systematized character instruction, are quite as dishonest, and often more

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so, than those who have not. In some cases the longer they receive character instruction the more dishonest they are.

(6) Discounting home background there is no greater honesty among children who attend church schools than among those who do not.

The Emergence of Personality.—If character is the individual's total customary reaction to his environment, what is personality? Is it a part of character, the sum total of the manifestations of character, or the elusive general factor in character?

Psychological definitions of personality do not agree but if we resolve those given by Watson, Woodworth, and Warren into a composite definition we may say that *personality is the integration of the individual's physical, mental, and moral habits.*

From such a definition we must conclude that personality, like character, is possessed by each individual in kind and degree. Each of us has personality in kind and amount and, as was said of character, it is shaded down from exceptionally strong to exceptionally weak. In fact, personality embraces all the traits described under character. What then is the difference between character and personality? Why should we use both terms? The answer lies in the means and methods for judging each.

We evaluate character through estimates or measurements of single traits and, as we have indicated, there is no general factor operative. Further we evaluate it best by judging what one does and what one says. On the other hand, personality is not measured by what one does or says but how he says or does it. Tone and gesture, says Berman, when not acted or posed, are the true measure of personality. While character is one's total customary reaction, personality is

represented by implicit habits. While the explicit habits of talking, writing, working, and reacting to moral situations are character habits, the implicit habits involved in thinking—the flick of an eyebrow, the turn of a lip, the smile, the sneer, the tone of voice—are personality habits.

Strong Personality as a Product.—Strong personality is not to be described in terms of instincts, temperament, morality, or intelligence save in the sense that one's postural tonus has been moulded by these. On the contrary it is ultimately measured by physical appearance and manner of expression. If one wishes to retain character in the definition, strong personality may be defined as character that attracts and forces attention because of its exceptional qualities. It is the result of gradual growth—a constant and consistent expansion—and is the end-product of both nature and nurture—what the individual is plus what happens to him.

Personality and Thought.—Thought must not be entirely read out of personality growth. We said above that the intellect, represented by implicit habits, helps to mould the postural tonus. However, personality sometimes pushes through without conscious direction—examples: the “beautiful but dumb,” the “forceful but ignorant,” and the “entertaining but inelegant.” In such cases the higher thought processes are not to be credited with personality development; the latter is to be traced to inherited dispositions and qualities.

Nor is personality growth guaranteed through education. There is a popular belief that observance of systematized procedures will enhance personality. The fact is, since personality so often emerges of its own accord, it is difficult to influence its development by methods of training. On the

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other hand, the direction of character formation may always be influenced.

The Rating of Personality.—Quoting from Warren again, personality is the general rating of the individual; it denotes the man's combined rating in the several phases of mental life. That this is a popular notion is witnessed in the large number of rating scales devised as subjective measures of personal qualities. But not only is it a fallacy to rate personality on mental life alone, it is a mistake to assume that the scales we have are used in rating qualities of personality. They are attempts really to estimate the value of character traits.

For example, note the twenty factors listed in the following scale for rating qualities of personality:

GENERAL RATING

QUALITIES OF MERIT	POOR	FAIR	AVERAGE	GOOD	SUPERIOR
Ambition					
Industriousness					
Persistence and patience					
Dependability					
Forcefulness					
Effectiveness of speech					
Self-confidence					
Friendliness					
Adaptability					
Tact					
Cheerfulness					
Good judgment					
Sensitiveness to criticism					
Ability to size up people					
Memory					
Neatness					
Health habits					
Discrimination					
Economy					
Capacity to delegate work					

FIG. 16

An efficiency score card for rating the qualities of "personality."

Most of the factors in the scale are traits of character. They represent *what* the individual does and says. A few, such as friendliness, cheerfulness, neatness, and effectiveness of speech represent *how* he does or says a thing. As a means of subjective measurement it includes both character traits and qualities of personality. To see the difference between traits and qualities is to see the relationship between character and personality.

TRAINING FOR GOOD CHARACTER

Terman lists such traits as obedience, conscientiousness, dependability, unselfishness, evenness of temper, and will power as moral traits. These are the traits involved in the building of character. Obviously then we may say that good character and morality are synonymous terms, but let us measure our statement by Terman's own qualifications. Morality, he says, depends upon two things: (1) the ability to foresee the possible consequences of different kinds of behavior; and (2) the willingness and capacity to exercise self-restraint. Training for good character likewise depends upon two things: (1) the ability to develop habits of goodness; and (2) the will power to carry out good intentions. The terms therefore mean the same thing.

The Problem of the School.—Whether or not a child's character is good or bad depends very much upon his early training and environment. Psychologists agree that the larger part of a child's learning takes place before the close of his fifth year. During those first few years it is the main task of the parent to "manage" the child. If that is poorly done it is sure to leave problems of correction and control of conduct. Again, much of the child's early environment is

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provided by persons who are not trying to "manage" him. Resultingly it is found that, when the child enters the directed school, much of that which has gone into the making of his character must be dissolved and replaced. How can that be done? What is to be the teacher's procedure?

Thought and Character.—It is not an uncommon belief that if a child can be taught to think his moral education will take care of itself. Certainly the converse of this theory is true—if a child cannot be taught to think he will be a feeble-minded delinquent. But what about the first theory? When we teach a child to think logically and critically is some attention to moral principles ensured? James says that the kind of excuse we most frequently hear from persons who find themselves confronted by sinfulness or harmfulness is, "I never *thought*." Lippman, in his treatment of moral training, all the way through puts the emphasis on thinking; and Martin comes out boldly with the statement that there is only one sound method of moral education: it is in teaching people to think.

Learning to think, in and of itself, does not however guarantee good character (morality). Terman shows that there are many intelligent criminals, that one may have the ability to foresee and weigh possible consequences yet not have the will power or capacity to exercise self-restraint; and Murchison has shown that many college students rank lower in intelligence than the average criminal. [The fact is, to in any way ensure moral development one's thinking must be directed toward moral outcomes and toward ideals of conduct. Even then there are sure to be exceptions.

Plans for Moral Education.—Educationalists, realizing the need for greater emphasis on training for good character,

have devised diversified plans for moral education, using the subject-matter of the classroom to make the lessons in moral training more effective. In some centers hours have been set apart for religious instruction of children in churches of their affiliation. From the psychological point of view these are right steps in the solution of a vexing problem. Some subject-matter, particularly that of history, literature, and the fine arts, lends itself to moral instruction; and the very atmosphere of the church is sure to encourage some degree of mind-set along the lines of character development. However, such methods singly or together will not provide a complete solution. We cannot rely entirely upon them. As Hartshorne and May have shown: some children are quite as dishonest, after receiving character instruction, as those who have not and attendance upon church schools is no guarantee of greater honesty. In the Hartshorne and May studies but one trait is reported upon but it serves as a guide in judging moral reaction.

Creating Levels of Conduct.—We have quoted McDougall to show that there are four stages in the child's conduct: the modification of impulse through pains and pleasures incidentally experienced; the modification of impulse through rewards and punishments systematically administered; the control of conduct through praise or blame; and the regulation of conduct through ideals of moral reaction. These four stages, it will be seen, may be utilized by the teacher in causing the child to behave rightly and therefore intelligently.

Measures of Correction.—The first three levels involve problems of discipline and the latter are comprised of measures of correction and means of reward. Let us consider first the measures of correction.

Measures of correction are divided into rules and devices, but, since a corrective device is always questionable unless it exactly meets the nature and needs of the particular child it is meant to redirect, we must propose recommendations broad enough to fit any case. Let us present recommendations and discuss each briefly.

1. Let the child know definitely what is expected of him. Subject to false perception, the child is limited in apperception and discrimination. The typical child, if he is not told exactly what is expected, will guess at it rather than ask for specific direction, and his guess will be wrong as often as right. This accounts for much of the wrong action we see in school children. If the child is told and then violates the rule, there will be other means for caring for this, but see first that he is told.

2. Do not threaten with punishment unless you are willing to administer it should it be needed. The teacher who tells the bad boy that, if he does not stop shooting paper wads, she will give him a severe punishment after school hours, must think first whether or not she will be willing to remain after school for such a purpose and would really carry out her threat. If she finds reason for not carrying it out, the child soon learns that the teacher is "all talk" and that he may "act up" if he so desires; nothing will come of it

3. Make the punishment "fit the crime" by making it meet the needs of the particular child, in so far as these may be determined. Here the teacher needs to study the child closely to determine what sort of treatment will secure the best results. It may be that the impulse to react in the wrong way is nothing but an impulse, and may be modified by reasoning with the child. On the other hand, the wrong act may have been premeditated, and nothing short of physical pain will

teach the child that it is not to be repeated. In this connection, if there is time the teacher should ascertain from the parents the type of punishment they have found to be best suited to the child. A denial of privileges, for instance, is effective with some children but embitters others.

4. Act immediately after the misdemeanor has been committed, but never in anger. Just as the element of satisfaction so strongly facilitates learning, the element of dissatisfaction cuts it off. Each, to gain the desired end, must be associated immediately with the learning act. The teacher, therefore, should directly follow up any wrong act with some corrective measure, so that the child will connect the correction with the act and avoid repetition of the latter. Never, however, should the teacher permit her own anger to influence her method of punishment, for, carried away by that emotion, she is likely to overdo the punishment and forever after have the child's ill will. Punishments, in themselves, are so often the direct result of anger in the person administering the correction that this point cannot be over-emphasized.

5. See that the child understands why he is being corrected. The correction cannot be effectively connected with the misdemeanor unless the child gives it the right meaning. For example, he may have done something in violation of a rule of which he was not aware. Ignorance of the law may not excuse his conduct; but, unless through the correction, he is taught what the law is, the punishment is better omitted. In this connection, it is well to say that sometimes the correction must be made immediately and the explanation provided later. Lack of time, because of other duties, may make this mandatory, but the explanation should be given at the earliest moment.

6. Impress upon the child that the presence of low stand-

ards in others does not justify their imitation Seeing the wrong actions of other children often leads the child into imitation of them, while, without these, his conduct might be exemplary. He may give this as an excuse. Here is the teacher's opportunity not only to help develop individuality in character, but also to appeal to the child to set examples for others.

7. If a misdemeanor once corrected has been repeated, be consistent in repetition of correction The child once corrected may repeat the wrong act either without thinking or to test the teacher's consistency. In either case, do not overlook the opportunity to show him that you "mean business," that you intend to see that rules are obeyed, and that he must learn to think about what he intends to do

8. Formulate rules which must be obeyed in order that the child may take his rightful place in the social world about him. Every normal child not only likes to be told what is immediately expected but likes to follow plans of procedure—likes to know what rules are to govern him in future reactions. This makes reasonable rules easy to enforce, but the great advantage here lies in the child's preparation for obedience to rules in the world outside the school. Everywhere he goes he will find rules of conduct, and the school is the best place to get him ready for their observance.

9. Insist on obedience and persist in securing it. Much of the waywardness of adolescent youth may be laid at the doors of the school. Many of the common crimes might have been and could be prevented by more insistence upon school rules of conduct and, through them, a greater respect for law created. Each time the child is allowed to "get away with" some minor misdemeanor, a habit for wrong practices is being strengthened.

Means of Reward.—Disciplining the child is not confined, however, to measures of correction. A good system of discipline includes the rewarding of good moral conduct when it appears, and such rewards as are offered may be in the form of prizes, privileges, and honors, or in the form of social praise. Here again certain rules to cover all cases may serve as guides. These, since they are but a restatement of the above rules as applied to rewards, need not be discussed here. They are as follows:

1. *Do not promise rewards you will not be willing to give.*
2. *Make the reward fit the good behavior by making it meet the needs of the particular child.*
3. *Act immediately after good behavior that deserves special reward, through prize, privilege, or promise.*
4. *See that the child understands why he is being rewarded.*
5. *Impress upon the child that the presence of high standards in others is worthy of imitation.*
6. *If good conduct once rewarded has been repeated, be consistent in adequate recognition of the repetition.*
7. *Formulate reward rules which will be elastic enough to apply to each and every child in the group.*
8. *Use rewards only in the effort to inculcate high ideals.*

Development of Ideals.—The fourth level of conduct, as given by McDougall, involves ideals of moral reaction. An ideal, we have said, is an idea to which is attached both feeling and a goal.

Since, within the family circle, the child meets in his own way nearly all of the typical situations to be found later, the indelible impressions and modes of conduct he carries away go far in determining his reactions to school situations.

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Among those traits built up through habits, and usually found among the well-behaved, are: sincerity, sympathy, kindness, unselfishness, self-control, patience, industriousness, promptness, and directness.

Through each of these traits the child develops feelings of right and wrong, and these feelings are necessary if ideals are to be inculcated in him. The "clear idea" the teacher gives the child must create feeling before it can act as an important motive for good conduct. To know the difference between right and wrong acts is invaluable; but the child who does the right thing because of ideals of moral reaction is on his way to success.

Practice in Moral Reaction.—One way to get the child to feel right about the thing he does is to adhere closely to the rules set out above. Such rules, or any others for the development of ideals, are not to be taught to him, however; they are to be lived by him. The teacher too should live those rules by setting examples the child is reasonably sure to emulate.

Above all, the child should be given practice in demonstrating the good effects of kindness, patience, and related qualities. Let him learn the right thing by doing it, and thereby learn, in the words of Stevenson, to "keep friends with himself." Build up self-respect in him by insisting upon cleanliness of body and in mind.)

It should be said again in this connection that a greater problem in moral training is presented by the children of foreign-born parents than those of native-born. Because of a difference in social background, the former must be trained in new moral habits. Their moral standards are often quite different from our own. The best place to begin is with habits of hygiene.

Group Standards.—When the teacher establishes rules which must be obeyed she is setting up standards by which conduct is to be measured. In some schoolrooms, say Hartshorne and May, honesty is the rule; in others, dishonesty; much depends upon the teacher and group morale. As Dewey says: *If the school represents community life it is organized on an ethical basis, but the rest remains between the individual teacher and the individual child.*

However, without guides to conduct the best of teachers will fail. The standards must be there. As for honesty as a measure of morality, let us see how it works out psychologically.

The Honor System and Honesty.—A well-known scheme for encouraging honesty among students is the honor system, evolved in different forms in schools and colleges to prevent cheating on examinations. Putting a student on his honor is a good psychological device. It gets results with the majority of any group, but it likewise may fail with the minority of any group.)

Vernon Jones states that there are individual differences in morals just as truly as there are individual differences in general intelligence or in knowledge of history and that, in a scale of truthfulness, for example, children have been found to distribute themselves from the end representing great deceitfulness to the end representing great truthfulness; nor can one draw a line anywhere on this scale that will separate the untruthful from the truthful.

Jones states further that, if test situations are really complex enough to measure the individual and if the motivation given for dishonesty is strong, then the distribution is continuous, extending from scores representing very low honesty to scores representing very high honesty. Again, since all

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the distributions available for separate traits indicate a continuous spread from lowest to highest and since we do not find any traces of negative correlation among desirable traits, it seems fairly certain that the scores from the most comprehensive battery of tests which could be given today in the field of morals would distribute themselves in a manner approaching a normal distribution curve.

While the above generalization is based on the conception that the scores represent samplings of a multitude of factors we can see the problem more clearly if we assume, for illustration, that honesty on examinations, under any form of the honor system, will be spread over the scale somewhat in this manner:

- 5 per cent will not cheat under *that* system.
- 25 per cent are likely to be honest.
- 40 per cent will be on the fence ; no pronounced convictions.
- 25 per cent will tend toward being dishonest.
- 5 per cent will cheat no matter what the obstacles may be.

Were the teacher faced with these conditions he would need to keep three things in mind. First, each student will have his own interpretation of honesty and of cheating. Second, the percentage divisions as indicated will not be comprised of the same students each time, the *percentages only* remaining relatively constant. Third, the person responsible for the examination will have his individual way of judging honesty.

The fact is, despite all attempts to test goodness by testing honesty or to create a permanent antipathy to dishonest practices, low-level morality, as Hartshorne and May have shown, still exists. It may be assumed that, because "delinquency areas" or "regions of social chaos" have been

mapped, dishonesty is practiced only by persons in and from such areas, that there are sections of the country where morality is not to be found in low-level stages; but science has shown us that the normal curve holds to a large degree anywhere; traits, characteristics, and powers are rather evenly distributed throughout the world.

Definitions of Morality Differ.—We said above that each student will have his own interpretation of honesty and that each instructor will have his individual way of judging honesty. For such reasons we have but a hazy idea of what goodness is. We cannot fairly test goodness by testing honesty, for that which is goodness today may not be goodness tomorrow. Further, an individual judged by his own standards may be good and honest at the same time but, judged by the standards of others, he may be good and dishonest or bad and honest simultaneously.

It is a well-known fact that when we begin to talk about honesty there are those who begin to think up ways of being dishonest. The solution therefore does not seem to lie in organized forms of moral education but rather in the enforcement of common-sense rules of conduct.

Handling the Individual.—Another thing the teacher should keep in mind is that the vagaries of the classroom are by no means a sure indication that a habit of transgression has become permanently fixed. He should treat the youth as fairly as he knows how, not necessarily as fairly as the youth sometimes thinks he should be treated. Today the youth may be among the five per cent engaged in cheating; tomorrow he *may* be high in the councils of the nation because of his goodness and honesty.

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Raising Standards of Conduct.—If, through some system of moral education, standards for moral reaction are elevated, there can be no serious objection to its use, but teachers cannot hide behind the system and expect goodness to perpetuate itself. They should continue to build by thinking more of creating moral conduct through precept and example than by testing it. If they see that education, in the last analysis, is but training for adaptation they will not be able to avoid so shaping their instruction that new and higher standards will be constantly created.

Lessons in Appreciation.—One of the best ways for arousing interest in habits of good behavior and for developing ideals is to intersperse, throughout the work of the school, lessons in appreciation of the fine arts, good literature, and the events of history, working through biography where possible. The conditioning factors may be at the same time incidental and far-reaching.)

The Development of Personality.—Personality, the physical manifestations of integrated physical, mental, and moral habits, owes its development in large measure to general good health and vitality. These are the basis for such qualities as cheerfulness, friendliness, neatness, and effectiveness of speech, as opposed to sadness, unfriendliness, slovenliness, and unconvincing manner of speaking. While weakness and ill health may be indicative of a type of personality, represented by such implicit habits as chronic frowning, sneering, and the like, good physical condition is usually characteristic of the compelling, attractive personality.

The psychoanalysts attach great importance to the relationship between physical condition and the growth of personality. Adler maintains that the inferiority complex

develops when an individual with some physical defect unconsciously develops some complimentary trait or quality as compensation and he insists that special physical defects are usually related to defects in the sex apparatus. With the first part of this theory psychologists are in general agreement; with the second part there is much disagreement. Physical defects *may* be related to defects in the sex apparatus but need not be. In any event, organic inferiority usually tends in the direction of the inferiority complex and personality growth is thereby disturbed.

Helping Personality Develop.—What is there the teacher can do to improve the child's personality? The inferiority complex, we have pointed out, tends to disappear as the feeling of inferiority diminishes and a feeling of inferiority is lessened by rewarding a child appropriately for his successes. But is there any way that the inferior personality (one in which no complex is detected) may be strengthened? It is very difficult, as we have said, to influence its development through methods of training but, if we maintain that it is best represented by physical manifestations, it is folly to argue that nothing can be done to improve these.

Obviously we must go behind the implicit habits involved in thinking to correct thinking itself, but we first must establish some standard, some ideal, some goal for development. The individual with good personality is clean in body and mind, cheerful, friendly, effective in speech, manly or womanly, and energetic and aggressive but, at the same time, gentle and sympathetic. The ideal once established the problem becomes one of developing these qualities to the point of integration.

Rules for Developing Personality.—1. *Teach the child to be clean in body by insisting upon habits of physical*

cleanliness at all times. It is much easier to be cheerful, friendly, and self-sustained if one is clean.

2. Teach the child to be clean in mind by precept and example and by penalizing unwholesome manifestations.

3. Teach the child to be cheerful and friendly and to have good address and to be gentle by teaching him good manners. To have good manners is not to attract undue attention.

4. Teach the child effectiveness in speech through voice placement and through the avenues of the speech arts.

5. Teach the child to be manly by giving him responsibilities in proportion to his maturity.

6. Teach the child to be sympathetic by insisting that he see the other side of every question, that he put himself in the other person's place.

7. Teach the child to be energetic, in proportion to his vitality, by showing him the gains from hard work and the losses from indolence.

8. Teach the child to be aggressive by causing him to practice decision and to choose his course.

In all of these the growth of personality is to be encouraged by causing the child to keep before him some ideal—for instance, the kind of person he would like to be.

QUESTIONS AND PROBLEMS

1. In what sense is thinking a moral act?
2. Analyze the definition: *character is the individual's total customary reaction to his environment.*
3. Show how habit may influence the growth of character.
4. How does character differ from reputation and record?
5. Defects in character may be traced to perception and feeling. Give examples.
6. It is not an unusual experience of those who pray to be

interrupted in thinking or in devotional attitude by ridiculous and incongruous sense-impressions. How do you account for this?

7. What are the three types of self-consciousness?
8. Show how specific emotions may affect character growth.
9. Show the relationship between character-growth and memory.
10. Taking a typical class group, what are the four levels of conduct to be distinguished in the reactions of the various members?
11. What advantage have behavior tests over tests of judgment?
12. In their studies of honesty what six conclusions have Hartshorne and May reached?
13. What meaning do you give to the term *personality*?
14. How are character and personality related?
15. What is *strong* personality?
16. Rate yourself by the use of the efficiency score card given in the text.
17. According to Terman upon what two things does morality depend?
18. Upon what two things does good character depend?
19. In what sense is moral education guaranteed if the child is taught to think?
20. Is moral education to be at all effective if the child is taught *how* to think without being taught *what* to think?
21. Briefly describe the *Iowa Plan* for moral education. (See references.)
22. How do the four levels of conduct lend themselves as guides to moral education?
23. Distinguish between measures of correction and means of reward.
24. State in your own words the nine rules for correction of the child's conduct.
25. A child in the classroom does something which, because of several factors, makes you very angry. What will be your reaction?
26. Give the substance of the eight rules for rewarding good conduct.

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27. Would you teach rules of conduct in developing ideals? Why?

28. Why should the children of foreign-born parents present greater problems in moral instruction than those of native-born?

29. What objections do you see to the author's application of the normal curve to the honor system?

30. What is the fundamental cause for dishonesty? In other words, why is it difficult to be honest under all conditions?

31. Show how ideals may be developed through lessons in appreciation.

32. Select eight qualities of personality and show what the teacher can do to develop them.

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CHAPTER XII

Teaching for Intelligent Behavior

We have seen that if one is to be normal he must have freedom for carrying out his plans. The price of freedom, however, is responsibility and, in accepting responsibility, the individual must make intelligent application of his mental powers. In other words, he must give expression to right *thinking through intelligent behavior*. What is intelligent behavior and how may it be improved through teaching?

THE PSYCHOLOGY OF INTELLIGENT BEHAVIOR

Behavior is not merely a matter of moral conduct. It includes all movements of the individual, from his simplest reflex actions to the highly complex activities peculiar to abstract and creative thought.

Behavior, obviously, is not always intelligent. Too often it is but a native seeking for satisfactions without well-defined sources for these. It is, in its commoner manifestations, but trial-and-success in which adequate adaptation is accidental. To be made intelligent it needs sufficient conscious direction to make adequate adaptation sure.

To define *intelligence* we may say that it is *the individual's capacity to adapt himself to a new situation*. Since the normal individual increases this capacity through new experiences his intelligence increases with learning. In other words, learning makes adaptation easier to him.

This description, however, is not complete until we include

interest and willingness as the inevitable outcomes of effective learning. Then, too, we must consider the use of the term *new*. There is no situation absolutely new. Association of ideas is dependent not only upon similarity but upon contiguity (ideas growing out of other ideas) and any *seemingly new* experience may be analyzed into countless elements drawn from previous experience. Even an idea of an idea is not altogether new, since it involves some processes developed at previous times

Degrees of Intelligence.—We have shown how mental growth curves for individuals and for groups run parallel to each other and how, through the measurement of mental ability, intelligence may be described in terms of amounts or degrees. In each instance there is evidence that individuals tend to be grouped at levels of intelligence; but this results only when individuals and groups compared are rated on their reactions to identical situations. That which is rated is the amount of the individual's adaptation to situations which afford an apparently fair basis for comparison.

Differences in Intelligence.—People in general are sometimes divided into two groups: the thinkers and the doers—thinking and doing in varying degrees, from almost nothing to something, from something to much, and from much to very exceptional. This characterization is not unsound, though many persons may be classified under both headings, for intelligence is comprised of thinking and doing—the efficient doing of right thinking.

Differences in intelligence are really differences in: (1) rightness of thinking; and (2) adequate application of thought. Inequalities of both kinds are traceable to the effects of environment, the latter guided by inherited traits

and characteristics; but differences in adequate application are created in another way by differences in physical structure—the individual with a speech defect, even though mentally able, can seldom lead in activities demanding intelligent application.

Kinds of Intelligence.—In discussing schemes for classification we have stated that there are *kinds* of intelligence as well as degrees. When persons excel each other in meeting identical situations, each who excels has a kind of intelligence that facilitates adaptation to the situation in which he excels. The rating given the individual in terms of degree is not, therefore, a full description; it can be only when the kind of intelligence has been taken into account.

We stated above that interest and willingness are important factors in effective learning. Interest being both native and acquired and will being the outgrowth of drive and desire, the kind of intelligence one develops is dependent upon interest and will. Interest involves attention; learning demands memory; so that attention and memory may be included as attributes of or factors in the individual's intelligence, these, however, having more to do with degree than with kind.

Interest and will, together with chance, determine whether one is to have a kind of intelligence that may be called *mechanical*, *social*, or *abstract*, or even a combination of two or three of these.

Mechanical Intelligence.—Mechanical intelligence implies a tendency to think in terms of concrete objects. Certain persons are classed as motor-minded—as able to work intelligently with tools and instruments. Artisanish and art-by-imitation grow out of such tendency. Persons who

go into these activities have a kind of intelligence, but it, as we have stated, may also be high in degree

Social Intelligence.—Social intelligence implies a successful application of mental power in dealing with people and in getting along with them. Here, more than in either of the other two kinds, interest and will are the dominating traits; and here, more than anywhere else, does the good personality manifest itself. One cannot get along with other persons—coöperate, follow, or lead—unless he is interested in them and their problems. While one may have a potentiality for dealing with others, he cannot be rated as socially intelligent unless he is willing to and does apply that mental power. Further, in dealing with people, great demands are made upon such qualities as cheerfulness, friendliness, cleanliness, and effectiveness of speech.

In social intelligence also one may receive a high rating although short in dealing with abstract problems.

Abstract Intelligence.—Abstract intelligence implies the power to apprehend symbolic relationships, and the power to respond to abstract qualities and ideas. In other words, it is the intelligent application of thoughtful conclusions to problems not directly represented by experience or by the presence of concrete objects. When one has abstract intelligence, therefore, he has gained something more than intellectuality; he has learned how to apply what he knows.

A Balance of the Three.—Although, through heredity and the accidents of environment, individuals tend to be grouped in one of these three classes, the desirable goal is a well-developed symmetry of the three—mechanical, social, and abstract intelligence being called into exercise when

needed. The man who, as president of a service club, pauses en route to the annual club dinner to repair his automobile and arrives in time to make a well-organized address on problems of economic policy, is a good example of one in whom the three kinds of intelligence are operative at will.

Language and Intelligence.—Thoughtful conclusions are essential to intelligent behavior, and the best evidence of intelligence is the evidence of thoughtful conclusions in the written or spoken word. In abstract and social intelligence the written or spoken word is almost the only evidence. In mechanical intelligence, because of the individual's knowledge of what to do and his successful application of that knowledge to situations demanding adeptness in dealing with concrete objects, his action should be classified as intelligent even though no word has been spoken. The word is there, formed in the thought which prompts the action, and the latter is merely a substitute for it. The mechanically-minded person who is able to give vocal expression to his intelligent action really belongs in the abstract-intelligence group. He is seldom discovered, but this is due to traditional methods of classification—the immediate conclusion that one who is mechanically-minded must be mechanically-minded and nothing more.

Intelligence and Physical Ability.—How much is the individual's intelligence (adaptation to new situations) dependent upon his physical ability? The man about to be run down by a motor car may know what to do in order to save himself, but cannot put his knowledge into effect because he is lame and cannot move fast enough. Does he lack intelligence? Not if he knows the right thing to do; but his intelligence is usually judged by his total reaction. A greater

disability might make it impossible for him to react at all to a situation requiring motor response. In that light he never could become highly intelligent unless he should find substitutes for motor activities.

The otherwise intelligent person, physically handicapped, does just that—he utilizes ideational processes to offset defects in physical structure; his will to succeed sees him through. Without will, without interest, without desire, the physically-disabled individual remains at the lower levels of intelligence.

In passing, it should be noted that the same holds true of moral reaction. The man bent on suicide, for instance, may know what to do to save himself, but, without the will to live, he may complete his act of self-destruction. For that reason we Anglo-Saxon peoples look upon suicide as an immoral act and think of the victim as mentally impoverished.

Economy in the Exercise of Intelligence.—In making adaptations, intelligence, as Binet believed, tends to hew to the line and to go in a definite direction. It has the power to look in upon itself and to alter its direction if expedient. It recognizes waste of movement, even waste in the thought processes, and it soon begins to economize in energy. Perceptual experience is transformed into conceptual experience, so that the intelligent person comes to react to the objects of a class, or to similar situations, in the same way, improving his reaction a little as he goes, and building up habits of intelligent behavior.

The process of learning to judge culminates in learning to reason, and, in reasoning, the various judgments lead to a conclusion. Thus is trial-and-success reduced to a minimum, and this is an advantage in learning, although an intelligent trial is always to be credited to the individual. *High* intelli-

gence, then, is further described as efficiency in thought and in action; it takes advantage of short-cuts in pushing toward its goals.

Deterrents of Efficiency.—High intelligence, of whatever kind, meets with obstacles, of course. In fact, it must at times select or create its own stimuli, and far too often it is checked in its potential accomplishments by the whims of fate. Some of our most intelligent people find themselves in positions where there is little or no demand for the exercise of their keenest mental powers. Sometimes this is because they are not symmetrically developed in the three kinds of intelligence, but a strongly significant reason may be more definitely set out—often they lack the necessary insight and foresight needed in finding proper stimuli for their exceptional abilities.

Again, the right application of mental powers may not be made at exactly the right time. It has been found that, in general, mental efficiency is lowest in the early hours of the morning and highest toward noon, dropping slightly after noon and rising gradually in mid-afternoon; and motor efficiency is slightly better in the afternoon than in the morning. When one engages in difficult mental work at the wrong time, at least three conditions, which operate against mental efficiency, are produced:

1. There is a decreased rate of work.
2. There is decreased accuracy of action.
3. There is a spread of fatigue to parts of the body not engaged in the work.

The third condition implies physical fatigue, often referred to as "mental fatigue." The fact is, one's mind does not tire; it is capable of going on and on so long as the physical structures do not fag. Besides the use of the mind at the

wrong time, there are, however, two conditions which may cause it to function ineffectively: (1) the use of it for intensive work over too long a period; and (2) the use of the mind in solving new and exacting problems.

Other Obstacles.—Still other obstacles in the way of high intelligence are: the lack of right foods at regular hours, and the lack of sufficient sleep at the right time. We spoke of these in connection with the treatment of nervous children but they are also closely related to the kind and degree of intelligence. Persons who eat heavily and who get little or no physical exercise cannot think intensely while persons who eat the wrong foods, too little food, or who eat at irregular hours are not properly nourished for the mental tasks required by intelligent behavior. Moreover the nervous system needs the relief that sleep affords, in regular amounts for each person. For the individual to prevent sleep by overtaxing the mental processes is to make it habitually and persistently elusive.

Any deterrent to the proper functioning of the nervous system, such as the constant use of drugs, is sure to modify behavior to degrees that may be characterized as unintelligent. Intelligence requires a clear mind. It is too much to expect it to fight against obstacles which need not be set up.

Intellectuality and Intelligence.—We said above that when one has abstract intelligence he has gained something more than intellectuality. Here we may make a differentiation. Intellectuality serves as a stepping stone to intelligent behavior. One possessed of information and knowledge must learn to use the tools that go with them, must put information and knowledge into efficient action, if he is to

make effective his powers of adaptation. It is one thing for him to know much; it is another to be able to apply what he knows. This is the chief difference between intellectuality and intelligence.

What Is Intelligent Behavior?—The individual who behaves intelligently takes the task at hand, formulates a plan and, by accepting responsibility, provides freedom for performing the task.

He makes outward application of right thinking—thinking in which conscious purpose withdraws from error and permits no intentional injury.

He profits from learning and exercises economy.

He shapes his behavior into a kind and strives for higher levels.

He has the power to substitute mental processes for physical disabilities.

His intelligence works, but it also rests; and, above all, it insists upon goodness. One's character, as we have said, may be at the same time strong and bad; not so his intelligent behavior. It looks to future ends. Signs of intelligence in persons who violate moral rules are but signs of "brightness"; and intelligence is more than "brightness"; it is "brightness" plus a feeling of rightness.

TEACHING FOR INTELLIGENT BEHAVIOR

In following through the application of psychology to education three main objectives of directed training may be designated. These are:

- (1) To teach the child to think.
- (2) To strengthen his moral reactions.
- (3) To cause him to behave intelligently.

In order that we may see these objectives in relation to each other and in order to test their soundness we may briefly review the ground covered, point out some specific needs not previously stressed, and indicate the probable general effects of applying the rules we have set up

Resumé of Developmental Procedure.—From all we have said about the child's behavior the teacher should see that, unless desirable habits are early inculcated, he or she can have little part in shaping the child's future. Seeing this, the following general rules may be utilized at appropriate stages:

1. *Do everything possible in the redirection of inherited tendencies.*
2. *Fix desirable habits as early as possible.*
3. *Help the child give right meanings to his sensations.*
4. *Arouse interest in and hold attention to right ideas and actions, associating these with feelings and emotions.*
5. *At every opportunity encourage creative imagination.*
6. *Stress language learning in order that ideas may be more easily comprehended.*
7. *Correct and redirect the building of character that intelligent behavior in the child may be increased in kind and degree.*

Provision for Stimuli.—To accomplish these things the teacher in any school grade must build on to or substitute for habits which are not leading in the right direction. In this, interests must be aroused, not by presenting those materials or problems the child would normally select but by making those problems, solutions for which point to immediate and remote goals, interesting in themselves. Through providing stimuli which arouse interest and hold attention the

child's feelings and emotions may be directed into such channels that his memory and imagination will be utilized in building habits directed toward right ends.

Backgrounds for Arousing Interests.—There are five prerequisites to effective teaching and these may be stated in the form of rules:

1. *To arouse the child's interests the teacher must have a thorough-going acquaintance with the community in which teaching is done.* Only through community contacts will the teacher be consistently able to appeal to interests and only through knowledge of community needs may he or she sustain them.

2. *The teacher must have a thorough knowledge of the subject-matter to be taught* That is, he or she must have a wealth of information that, from the knowledge side, ready answers may be found to the many questions children will ask.

3. *The teacher must be familiar with the best methods for presenting subject-matter.* It will profit the teacher little to know a subject-field exceptionally well and not be able to explain its problems to the less mature. The methods for arousing and sustaining interests through subject-matter must be learned through training.

4. *The teacher must know more about life than any child in the classroom and must put information and knowledge into efficient action.* This means that the teacher must know how to think, for successful teaching demands not only critical but creative thinking. There is hardly a discussion period in the daily teaching program which does not exact the latter.

5. *The teacher must have good character.* Effective teaching comes only through human contacts and these contacts

should function in building intelligent behavior. The teacher must therefore have convictions about rightness and, when occasion demands, must be firm. With firmness, however, should go fairness, kindliness, patience, and sincerity.

By being possessed of both good character and intelligence the teacher's load may be reduced by half through the examples he or she sets.

Achieving the First Objective.—The normal child is natively equipped to engage in at least four types of thinking—reverie, wishful thinking, empirical thinking, and rationalization—and the well-trained teacher utilizes these respectively in four ways. He attempts to create better images. He tries to inculcate better ideals. He initiates critical thinking through the facts of sense-experience. He lays the foundations for logical thinking.

As the child passes through the grades from the kindergarten to the college his teachers make sure that he is confronted with problems drawn from his own experience or from the subject-matter of the classroom. The facts on which these problems are based are used for establishing values and relationships, and the child is taught to arrange them in logical order that they may lead to sound conclusions. Furthermore he is drilled in criticism of these conclusions, and is caused to verify them by further observation and experimentation. Throughout the process he is encouraged to supply missing elements in each learning situation, and to make new combinations of elements already present. Thus is he raised from day dreaming to creative thought, a gradual change in imagery that takes him through productive and constructive stages.

Achieving the Second Objective.—Training in thinking is not complete, however, unless all along the line it is di-

rected toward moral outcomes and ideals of conduct. The normal child's conduct is modified by rewards and punishments and by praise and blame. These the wise teacher utilizes in holding him to a purpose and in creating in him the desire to do the right thing because it is right. Whatever training in thinking he may have had will have been wasted if he does not use his mental powers for the common good of those about him, and if he does not employ the ardor and fire, with which he often answers his natural drives, in helping to raise the level of common conduct.

The wise teacher, therefore, makes correction and reward fit the needs of the child. He insists upon obedience. He encourages high standards. Above all, he tries to keep the child's thinking clean, so that it may always be a natural expression of self-respect.

Achieving the Third Objective.—If the teacher can do these things, i.e., if, while teaching the child to think, he can create in him a persistent feeling of moral responsibility, he will have done all that is possible to make the child's behavior intelligent. Part of the child's intelligence is due to his endowment, and part of it to his training. Whether it takes a trend toward mechanical, social, or abstract expression is of no great importance if it looks to future ends, and if it adapts itself to every-day experiences in such way that the best of these ends are attained.

Need for Guidance.—Obviously, these objectives demand consistent guidance of the child, and guidance, in turn, calls for careful attention to the abilities and needs of individual pupils and to the activities in which they do and will engage. They make it necessary moreover to give consideration to proper placement both within the school and in outside activities and occupations.

Need for Study Rules.—Proper guidance means that not only must school facilities be adapted to the capacities and interests of the various children but that, as subject-matter is provided, children must be guided in their study of it. Here individual differences and emotional influences limit the application of many laws for successful study but excellent results may be secured if the few simple rules we have given are emphasized and enforced.

Teaching for Independent Thinking. —All through instruction the teacher should keep in mind that, to develop facility in right thinking, the affective life must be transcended by the thought life but that feeling must be utilized to stamp in the habits to be developed. Lessons for appreciation, for instance, must be presented in such manner that the child will come to feel *with* the teacher the beauty of expression in word, song, or painting. In such lessons he should be allowed to choose the things which appeal to him and the teacher should find out first the things which may make an appeal, then present these in such manner that feelings and emotions will be swept along.

Transmitting the Life Spark.—The modern progressive teacher sees the pupil as an individual who must grow and live. He believes that, in every human situation, there is a choice between unfoldment and repression. Freedom, in that light, is not mere absence of interference but the individual's chance to develop power in making decisions wisely. The child is encouraged to do not as he likes but as he thinks best.

Finally the teacher should not overlook the importance of the incidental remark in transmitting the life spark to the pupil. The incidental remark often gives great inspiration for achievement. Freedom to make decisions plus the inci-

dental remark should create a desire to learn for the sake of learning, and this objective outweighs all the rest.

QUESTIONS AND PROBLEMS

1. Define behavior by showing its all-inclusiveness.
2. Apply the definition of intelligence given in this chapter to the individual with little or no schooling. Does it work?
3. What have interest and willingness to do with intelligence?
4. Distinguish between degrees of intelligence and kinds of intelligence.
5. Show the place of language in intelligent behavior.
6. In what ways may physical disabilities handicap intelligent behavior?
7. Give an example of the exercise of economy in intelligent behavior.
8. Discuss insight as a factor in social intelligence.
9. Improvise for yourself a daily program which will facilitate efficient mental work.
10. State the three main objectives of directed school training.
11. What are the backgrounds the teacher must have in order to arouse and hold the interests of the child?
12. Discuss the need for high intelligence in the teacher. Does he need it for low-grade mentalities?
13. What would you do if a child in the classroom should ask you a question you could not answer?
14. Show the exact importance of good character in the teacher.

15. Outline the ways in which a child may be taught to think.
16. What would you do in trying to build good character in the child?
17. How can you best teach for independent thinking? Justify your procedure.
18. Discuss incidental remarks by teachers in inspiring greater achievement.

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APPENDIX

STATISTICAL INTERPRETATION OF MEASUREMENT

NOTE: Throughout this volume the author has attempted to avoid duplication of material presented in courses other than educational psychology. For that reason statistical method has been omitted from the text proper. It is here appended in order that the instructor, in institutions where a separate course in statistical procedure is not offered, may make its simpler methods available.

It is the author's belief that every teacher and prospective teacher should be familiar with elementary statistical method, not only for its use in the interpretation of test results but because it enables the student of education to more easily comprehend the materials of current educational literature.

(The five methods presented herein are best used in connection with the discussion of the measurement of mental growth. The instructor will find it profitable to devote at least one class period to each method, and the student should be provided with sample problems for drill.)

PRELIMINARY PRACTICE

TABULATION OF TEST RESULTS

The following pages present two methods for finding averages, two methods for finding amounts of variation from the average, and one method for finding the amount of

correlation between two traits, qualities, or powers. With the exception of the method of correlation, each assumes a large number of measures.

In the first four methods grouped series of measures must be arranged in frequency distributions, i.e., each measure must be tabulated in its proper interval. There are four rules for the arrangement of a grouped series of measures in a frequency distribution: (1) get the range; (2) get the class-interval; (3) set the position of the class-interval, or determine specific class limits; and (4) tabulate the frequencies. The procedure is best explained by taking the items or measures in their original form, as illustrated in Table I.

TABLE I. INDIVIDUAL SCORES REGISTERED BY ONE HUNDRED PUPILS

99	92	88	85	84	83	82	80	75	72
98	92	88	85	84	82	82	79	75	71
98	92	88	85	83	82	82	79	75	71
97	91	88	85	83	82	82	79	74	70
96	90	87	85	83	82	82	78	74	70
95	90	86	85	83	82	81	78	74	70
95	89	86	84	83	82	81	77	74	69
95	89	86	84	83	82	81	76	73	69
94	89	86	84	83	82	81	76	73	68
93	89	86	84	83	82	81	76	73	67

It will be seen that the lowest score registered is 67 and the highest score, 99. Thus the range in scores is 32, or 67 to 99. The size of the class-interval is determined by the rule that a good working number is 15 units, with a maximum at 20 and a minimum at 7. With a small range we may

select the minimum and begin tabulating. (See Table II for complete tabulation of the 100 scores in Table I.)

TABLE II

Illustrating Tabulation in a Frequency Distribution.

CLASS-INTERVAL	TABULATION	FREQUENCY (f)
96-100		5
91-95		9
86-90		16
81-85		40
76-80		10
71-75		13
66-70		7
SUM OF FREQUENCIES		$100 \leq f$

METHOD ONE

THE ARITHMETIC MEAN

The *arithmetic mean* of a series of measures is simply the sum of the series divided by their number. When the number of measures is small, the teacher need only add them and divide by the number. However, when the number is large, the frequency distribution is a time-saver and should be employed. The use of the frequency distribution in finding the arithmetic mean is illustrated in Table III.

Steps in the Computation.

1. Arrange the measures in a frequency distribution, and total the frequencies, N .
2. Estimate the interval which contains the mean by counting in half the frequencies. The mid-point of that interval is the estimated mean.
3. Allowing the interval containing the estimated mean to

be represented by 0 in the column of deviations, and, treating each interval as a unit of one, number the intervals in each direction in regular order, using the signs.

4. Multiply each deviation (d) by its corresponding frequency (f), preserving signs. This gives a column of frequency deviations (fd).

5. Find the algebraic sum (difference between negative and positive sums) of the column of frequency deviations, and divide it by the number of measures (N) to get correction prime.

6. Multiply correction prime (c') by the size of the interval, to get the total correction. (The size of the interval will

TABLE III. ILLUSTRATING METHOD FOR LOCATING ARITHMETIC MEAN

Interval	f	d	fd	(Divide)
96-100	5	+3	+15	
91-95	9	+2	+18	
86-90	16	+1	+16	
				100) -8.
				- .08 = c'
81-85	40	0	+49	
76-80	10	-1	-10	(Multiply)
71-75	13	-2	-26	
66-70	7	-3	-21	
				- .08
				5 (size of interval)
$N=100$			-57	
				-40 (correction)
				- 8 = $\sum fd$
				(Subtract or add according to sign of correction)
				83.5 (estimated mean)
				.4
				83.1 (true mean)

not always be the same; it varies in different distributions.)

7. If c is positive, add to the estimated mean; if negative, subtract from the estimated mean; the result is the arithmetic mean.

In Table I, N represents the number of children, in this

case 100. Five of these children made scores between 96 and 100 inclusive, nine made scores between 91 and 95 inclusive, and so on down; f represents frequency—the frequency with which scores appear in certain intervals, d represents deviation—the numbering of each interval in regular order in each direction from zero; fd represents the frequency at each interval multiplied by its respective deviation. Σ represents “the sum of ”

In the problem given, the average score (arithmetic mean) for one hundred pupils is 83.1. In other words, the tendency of the group is to make scores in the neighborhood of 83. The amount of variability from 83 is to be considered later.

METHOD TWO

THE MEDIAN

The arithmetic mean takes into account the size of the extreme scores. The *median*, another average, gives us the middle score without taking into account the size of the extreme scores. Where the number of pupils is small, the teacher may find the mid-score by arranging the papers in order of magnitude of score, and then counting in to the middle paper. Where the number of pupils is large, the method for finding the median should be employed. Using the same set of figures as in Method One, Table IV illustrates the method for finding the median.

Steps in the Computation.

1. Divide the total number of measures by 2.
2. Begin at the top of the column of frequencies and count down half of the total number of measures, without exceeding that number. Subtract the result from one-half of the total measures.

3. Multiply by the size of the interval.

4. Divide by the next number of frequencies below where you left off counting—the number at the middle interval.

5. Subtract this quotient from the lower extreme of the interval directly above the median interval. The result is the median.

(To check the foregoing computation, count up from the base of the column of frequencies. The procedure is identical, except when the final quotient is computed, it is added to the lowest extreme of the middle interval.)

TABLE IV. ILLUSTRATING THE METHOD FOR FINDING THE MEDIAN

Interval	f	(Computation)	(Check)
96-100.....	5		
91- 95.....	9		
86- 90.....	16	2)100	2)100
		<u>50</u>	<u>50</u>
- 81- 85.....	40	30	30
		<u>20</u>	<u>20</u>
76- 80-.....	10	5 (int.)	5 (int.)
71- 75.....	13	40)100	40)100
66- 70.....	7	<u>25</u>	<u>25</u>
	<u>N=100</u>		
		86	81
		<u>25</u>	<u>2.5</u>
		83.5 = Median	83.5 = Median

In the problem given, the average score (median) for one hundred pupils is 83.5. The central tendency of the group is to make scores in the neighborhood of 83. This time the average score does not take into account the size of the scores, but tells us that fifty per cent of the pupils made scores above 83 and fifty per cent made scores below 83.

The coincidence of the two average scores (the median of this distribution varies but .4 of a point from the arithmetic mean) is due to the fact that the distribution approximates the normal curve of probability.

The amount of variability from the median is to be discussed under Method Four.

METHOD THREE

THE STANDARD DEVIATION

To accompany the arithmetic mean we have a measure of variability known as the standard deviation. While the arithmetic mean gives us the average score, the standard deviation tells us how far away from the average the majority of scores vary. In other words, it gives us the range of central tendency. (Using the same set of figures as before, Table V illustrates the method for finding the amount of standard deviation.)

Steps in the Computation.

1. Arrange the measures in a frequency distribution, and total the frequencies.
2. Number the deviations above and below the mean interval, and compute the sum of the fd column. (The procedure is the same as in the location of the arithmetic mean.)
3. Compute the fd^2 by multiplying the numbers in the fd column by the numbers in the d column. In this computation the signs disappear, and the sum of the fd^2 is found by totalling all the numbers in the fd^2 column.
4. Divide the sum of the fd^2 by the number of frequencies (N) to get the standard deviation squared (S^2), without the correction. Divide the sum of the fd by the number of frequencies to get the correction (c).
5. Square c and subtract the result from S^2 . This gives the standard deviation squared.

6. Extract the square root of SD^2 and multiply by the size of the interval, obtaining the standard deviation.

TABLE V. ILLUSTRATING THE METHOD FOR FINDING STANDARD DEVIATION

Interval	f	d	fd	fd ²	(Computation)		
96-100	5	+3	+15	45	-57	100)-8	→ 08
91-95	9	+2	+18	36	+49	-	08 = c
86-90	16	+1	+16	16	-8 = $\sum fd$		.0064 = c ²
81-85	40	0					
76-80	10	-1	-10	10	100)222		
71-75	13	-2	-26	52		200 = 5 ²	
66-70	7	-3	-21	63			2 2200
							→ 0064 (sub.)
N = 100				-57 222 = $\sum fd^2$			2 2136 = SD ²
					$\sqrt{2.2136} \approx 1.49$	1 49	
						→ 5 (int.)	
							7.45 = SD

In reporting the arithmetic mean, it should always be accompanied by the amount of standard deviation. In the problem given, the arithmetic mean is 83. With the standard deviation included, the central tendency reads: A.M. = 83 $\pm$ 7, the fractions dropped off for convenience. The range of central tendency, then, is from 83 plus 7 to 83 minus 7, or from 90 to 76, meaning that the majority of scores appear between these two points on the scale.

METHOD FOUR

THE QUARTILE DEVIATION

To accompany the median, we have a measure of variability known as the quartile deviation. (Table VI illustrates the method, the same figures being employed.)

Steps in the Computation.

1. Arrange the measures in a frequency distribution and total the frequencies.

2. Divide the total number of frequencies by 4, and count down one-fourth of the frequencies, without exceeding that number.

3. Subtract the sum secured from one-fourth of the frequencies; multiply the remainder by the size of the interval; and divide the result by the next number of frequencies.

TABLE VI. ILLUSTRATING THE METHOD FOR FINDING QUARTILE DEVIATION

Interval	f	(Computation)	
96-100 5			
91- 95 9	14 ($\frac{3}{4}$)	4)100	4)100
		25	25
86- 90 16		14	3
81- 85 40	70 ($\frac{3}{4}$)	—	—
		11	75
76- 80 10		5 (int.)	70
71- 75 13		—	—
66- 70 7		16)55	5
		3.44	5 (int.)
	N=100		10)25
			2.5
		91	
		3.44	
		87.56 = Q_1	81
			2.5
			78.5 = Q_2
87.56			
78.5			
2) 9.06			
4.53 = QD			

4. Subtract the quotient from the lower limit of the interval containing the last frequencies counted. The remainder is Q_1 , or the mid-point of the upper fifty per cent of the frequencies.

5. To get Q_3 , count down three-fourths of the frequencies and follow the procedure outlined for Q_1 . The result is the mid-point of the lower fifty per cent of the frequencies.

6. Subtract Q_3 from Q_1 , and divide the remainder by 2. The final quotient is QD , the quartile deviation.

In reporting the median, it should always be accompanied by the amount of quartile deviation. In the problem given, the median is 83. With the quartile deviation included, the central tendency reads: Median = 83 ± 5 . The range of central tendency, then, is from 83 plus 5 to 83 minus 5, or from 88 to 78, meaning that fifty per cent of the scores appear between those two points on the scale.

If we assume that two groups have the same average, but with a difference in amount of deviation, the necessity for using each type of deviation with its respective average is obvious.

METHOD FIVE

THE COEFFICIENT OF CORRELATION

To determine the amount of correlation between two traits, qualities, or powers, we have the Spearman *Rank-Difference Method*. The rank-difference method answers ordinary classroom needs and its coefficients may be transmuted to those derived from the Pearson Product-Moment Method if desirable. Table VII illustrates the use of the Spearman rank method for finding the amount of correlation between scores in arithmetic and scores in reading for ten children. ~~The coefficient by this method is designated as ρ , and the amount of its reliability (fluctuation) is expressed as probable error.~~

TABLE VII. ILLUSTRATING SPEARMAN'S RANK-DIFFERENCE METHOD

CASES	ARITH.	RANK	READ	RANK	+	-	d^2
1	25	4.5	35	3.	1.5		2.25
2	✓ 28	2.	40	1 5	.5		.25
3	20	6.5	28	6.	.5		.25
4	16✓	9.	23	8.	1.		1.
5	19✓	8.	18	9.		1.	1.
6	✓ 26	3.	16	10.		7.	49.
7	14	10.	29	5.	5		25.
8	20	6.5	26	7.		.5	.25
9	✓ 31	1.	40	1.5		.5	.25
10	. 25	4 5	30	4.	.5		.25
					9.0	9.0	79.50 = $\sum d^2$

$$rho = 1 - \frac{6 \sum d^2}{N(N^2 - 1)}$$

$$79.5 = \sum d^2 \quad 10 \quad 100$$

$$\quad \quad \quad 6 \quad 10 \quad 1$$

$$477.0 = 6 \sum d^2 \quad 100 = N^2 \quad 99$$

$$\quad \quad \quad 99 \quad 990 \quad 477.$$

$$\quad \quad \quad 10 \quad \quad \quad .48$$

$$990 = N(N^2 - 1) \quad 1.00$$

$$\quad \quad \quad \quad \quad .48$$

$$\quad \quad \quad + 52 rho$$

$$P.E. = .6745 \frac{1 - rho}{\sqrt{N}}$$

$$\quad \quad \quad .52 \quad 1.0000 \quad \sqrt{10} \quad 3.16$$

$$\quad \quad \quad .52 \quad .2704$$

$$\quad \quad \quad .2704 = rho^2 \quad .7296$$

$$\quad \quad \quad 3.16 \cdot 7296$$

$$\quad \quad \quad .231$$

$$\quad \quad \quad .6745$$

$$\quad \quad \quad .16 = P.E.$$

Steps in the Computation.

1. Rank the measures in order of size, beginning with the largest.
2. For each case (child) tabulate the difference in rank

for the two achievements measured, in the plus and minus columns.

3. Square each difference in rank and place the square in the d^2 column.

4 Total the plus column and the minus column. The sums should be equal; if not, an error in ranking has been made.

5. Total the d^2 column and multiply by 6. Divide the product by $N(N^2-1)$, N being the number of children; and subtract the quotient from 1; the remainder is *rho*, the coefficient of correlation.

6. Find the *probable error* by using the fixed formula given.

7. If it is desirable to report the coefficient in terms of the Pearson r , transmute *rho* into r by use of Table IX.

In the problem given, $\rho = +.52$. With the *probable error* included, the coefficient reads: $\rho = +.52 \pm .16$. The range of correlation, then, is from $+.36$ to $+.68$. (ρ will be negative when $6 \Sigma d^2$ is greater than $N(N^2 - 1)$.)

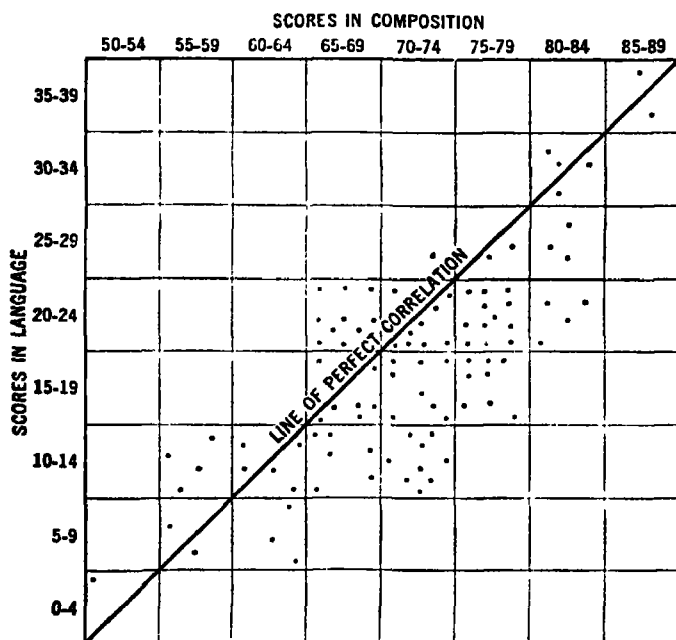
Meaning of Coefficients. ✓

The whole number 1 appearing in the Spearman formula represents perfect correlation. Perfect positive correlation is represented by $+1.00$; perfect negative correlation is expressed by -1.00 ; no correlation is represented by 0. The value of the coefficient, therefore, ranges from -1.00 , through 0, to $+1.00$.

For purposes of prediction, a coefficient below .50 is usually considered to have little usefulness; one that falls between .50 and .60 shows evidence of some relationship; one that falls between .60 and .70 shows a real relationship and has

a limited usefulness; and one above .80 indicates unusual relationship, with prognostic value.

TABLE VIII. A Pictorial Representation of a Positive Correlation.



The Pearson Product-Moment Method.

Where a great many cases are involved, the use of the rank-difference method of correlation becomes a complicated and laborious task, and Pearson's product-moment method is substituted. While the Spearman method takes account only of the position of the measures, the Pearson method includes their absolute amounts. The latter is therefore more reliable, but, as we have said, there is little demand for its use in ordinary classroom problems. We are able, however, by use of Table IX, to transmute ρ into r , the Pearson coefficient.

TABLE IX. VALUES OF r FOR CORRESPONDING VALUES OF ρ

ρ	r	ρ	r	ρ	r	ρ	r
.01	.0105	.26	.2714	.51	.5277	.76	.7750
.02	.0209	.27	.2818	.52	.5378	.77	.7847
.03	.0314	.28	.2922	.53	.5479	.78	.7943
.04	.0419	.29	.3025	.54	.5580	.79	.8039
.05	.0524	.30	.3129	.55	.5680	.80	.8135
.06	.0628	.31	.3232	.56	.5781	.81	.8230
.07	.0733	.32	.3335	.57	.5881	.82	.8325
.08	.0838	.33	.3439	.58	.5981	.83	.8421
.09	.0942	.34	.3542	.59	.6081	.84	.8516
.10	.1047	.35	.3645	.60	.6180	.85	.8610
.11	.1151	.36	.3748	.61	.6280	.86	.8705
.12	.1256	.37	.3850	.62	.6379	.87	.8799
.13	.1360	.38	.3935	.63	.6478	.88	.8893
.14	.1465	.39	.4056	.64	.6577	.89	.8986
.15	.1569	.40	.4158	.65	.6676	.90	.9080
.16	.1674	.41	.4261	.66	.6775	.91	.9173
.17	.1778	.42	.4363	.67	.6873	.92	.9269
.18	.1882	.43	.4465	.68	.6971	.93	.9359
.19	.1986	.44	.4567	.69	.7069	.94	.9451
.20	.2091	.45	.4669	.70	.7167	.95	.9543
.21	.2195	.46	.4771	.71	.7265	.96	.9635
.22	.2299	.47	.4872	.72	.7363	.97	.9727
.23	.2403	.48	.4973	.73	.7460	.98	.9818
.24	.2507	.49	.5075	.74	.7557	.99	.9909
.25	.2611	.50	.5176	.75	.7654	1.00	1.0000

QUESTIONS AND PROBLEMS

1. Find the arithmetic mean, standard deviation, median, and quartile deviation of the following distribution:

<i>Interval</i>	<i>f</i>
70-74	2
65	2
60	2
55	2
50	2
45	2
40-44	2

2. By use of the Spearman Rank-Difference Method, find the coefficient of correlation, with its probable error:

Test I	52	60	41	55	60	49	46	54	50	58
Test II	65	65	77	45	107	71	85	55	60	65

3. What is the advantage of a frequency distribution over a simple series of scores?
4. Why do we say that an interval of 96-100 is an interval of 5?
5. Show the technical difference between the mid-score and the median.
6. Why should we use a measure of variability in giving a complete expression of central tendency?
7. What is meant by the *probable error of rho*?
8. In ranking scores, what do you do when two or more scores are the same?
9. Give an example of a high correlation by specifying two traits.
10. Justify the use of a mental-ability score in making up a pupil's general average.

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