THEORIES OF LEARNING AND THEIR
EDUCATIONAL IMPLICATIONS

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Florence H. Van Bibber
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CHAPTER I

INTRODUCTION

Learning, as a problem in psychology and education, has assumed a position of major importance. From that time when Ebbinghaus published his studies on Memory, the significance of the problem for psychology and education has been recognized, and research, both experimental and philosophical, has assumed tremendous proportions. At the present time, the literature that is available on the subject is practically inexhaustible.

In the earlier period, learning was considered to be a problem of practical concern to educators only, and as a result of this, earlier educational theory and method were based upon the principles of associationism, the then-current psychological theory of learning. In this earlier period the literature published was devoted to the practical application of psychological theory to problems in education. Within more recent time, however, learning has become the recognized problem of the systematic psychologist. Experimental studies of the problem in its various aspects or manifestations have been published in large numbers. The leading psychological periodicals have even given over entire issues to the problem, these issues including large bibliographies which lend impressiveness, to say the least.
The psychologist is not at all concerned with the application of later findings to the problems in education. With this change of emphasis has gone a noticeable change in the published literature. Today, the great body of research is filled with the theoretical study of the problem and there is a noticeable dearth of literature applying the findings of late research to the practical problems of education.

As the various schools of psychology have laid their foundations upon broad principles, each school has promulgated a theory of learning which is harmonious with its basic principles. As a result, there have been numerous major theories advanced, and in addition there have been offered more numerous variations of these major theories. In this regard, Freeman says:

"Because so much has been said and written of the learning process, one sometimes gets the impression that it is central, almost the only problem of psychology. As a result of such undue emphasis innumerable 'theories of learning' have been built upon special details of behavior, without recognition of a common thread. Each of these theories was first presented as a description of modifications produced in a special type of learning experiment and then was developed as an explanation of all learning. This transfer from description to explanation

naturally led to hypothetical principles, and the pages of our scientific journals are filled with the arguments of the counter schools; for instance, the trial and error theory is contrasted with the conditioned reflex theory and with the configural theory." 2

Theoretically, it seems reasonable to expect the science of education to embrace and put into practice the newer findings of the science of psychology with regard to learning. Actually, this is well nigh impossible since there is no unanimity of opinion among psychologists regarding the concepts of learning. At the present time, it seems to be rather generally agreed among these same psychologists, that no satisfactory and infallible functional theory of learning can be formulated until the problem of the physiological changes which take place within the organism when modification occurs, has been satisfactorily solved by the neurologist and physiologist. As education must wait upon psychology, so psychology must wait upon biology for a true and unchallenged theory to cover the learning process.

There is, however, always the possibility that some theory advanced at the present time is fundamentally correct as far as it goes. As stated before, there is no scarcity of psychological theory. Hence, it seems logical that the science of education should be based upon that theory which most nearly correlates with the latest

findings of neurology and physiology. All theories are more or less hypothetical but that theory which is most in harmony with the experimental findings regarding the physical organism to be educated will have the most defensible basis as an educational theory of learning.

It is assumed in this study that a certain knowledge of psychology and psychological principles is essential and necessary in discharging the duties of an educator, both in the executive and teaching function. "The teacher will, other things being equal, be the more successful who can apply psychology, the science of human nature, to the problems of the school." It is likewise assumed that the laboratory findings of neurology and physiology are valid and acceptable as interpreted by the experimenters in their bearings upon the problem of modification, or learning.

The Problem

The problem of this study falls into three divisions:

First: To determine the basic principles of the three theories of learning, Bond Theory, Conditioned Response Theory, and Gestalt Theory.

Second: To determine the differences and similarities in these three theories; reconciling, in so far as possible, the Bond Theory and Conditioned Response Theory with Gestalt Theory.

Third: To apply the basic principles of that theory of learning which is found to be in closest harmony with modern experimental findings in physiology and psychology to certain specific problems in education.
CHAPTER II

BIOLOGICAL BASES OF LEARNING

Many theories have been advanced to describe and explain the changes which occur in the structure of the organism when modification takes place, and likewise to explain the causes of these changes. Early theories were based upon the concept of ideas pigeon-holed or stored away in cells in the brain. This was the extreme view of localization of function.

"Descartes was two centuries in advance of a knowledge of the brain as a network of fibers. He thought, nevertheless, of the localization of ideas within the brain; in fact, it was easier to think of the brain as a storehouse when it was not known to be a mass of pathways. Thus, when the mind wishes to recall something, the animal spirits—so Descartes thought— are impelled toward different parts of the brain until they come upon that where the traces are left of the thing it wills to remember, where the pores are which were used when the thing was perceived. When one imagines something, the spirits, according to Descartes, have opened pores in the proper part of the brain. When one keeps the attention fixed, the direction of the spirits within the brain is preserved constant. All this theory takes on meaning only in connection with the history of the localization of function in the brain, a history with which we are already familiar."

Later theories have been based upon the validity of the concept of the reaction of the entire neural structure, par-

particularly emphasizing the importance of the function of the synapse. Most of these theories assume that the law of exercise operates in such a way that impulses over neural paths wear down or "stamp in" the patterns of excitation. In this way, associations are formed and strengthened.

Sherrington's theory of the synapse is perhaps the best known and most widely accepted among current theories.

"It seems...likely that the nexus between neurone and neurone in the reflex arc, at least in the spinal arc of the vertebrate, involves a surface of separation between neurone and neurone; and this as a transverse membrane across the conductor must be an important element in intercellular conduction. The characters distinguishing reflex-arc conduction from nerve trunk conduction may therefore be largely due to intercellular barriers, delicate transverse membranes, in the former.

"In view, therefore, of the probable importance physiologically of this mode of nexus between neurone and neurone it is convenient to have a term for it. The term introduced has been synapse." 2

This semi-permeable membrane has a higher resistance to a nerve impulse than a nerve fiber and it is believed that repeated passage of an impulse over this synapse will lower the resistance and facilitate modification. The greater or less permanence of this modified resistance will serve as effectively to account for retention or memory as to account for learning. Cason and

Johnson have offered modifications of this theory of synapses.

"Cason has enumerated several ways in which the structure of the membrane might be modified as a result of the passage of nervous impulses. For example, persistent electronic bombardment might cause a reorientation of the molecules of a membrane and so increase its permeability. He describes how the passage of a nerve impulse over a synapse might well cause a migration of hydrogen ions toward the end-brush, thereby rearranging the molecules of the dendritic membrane so that electrons could pass more easily from axone to dendrite. As a blow can rearrange molecules in magnetized iron only temporarily, so the membrane structures constituted by the passage of nerve impulses would tend to disappear.

"Another suggestion made by Cason and by Johnson is that altered surface film tension accounts for synaptic changes in learning. Johnson's very detailed hypothesis begins with the assumption that ionized molecules are absorbed on the cell membrane, constituting a surface film tension which is in constant oscillation. This oscillatory change is due to the transfer of ions through the membrane as a result of the ordinary metabolic processes of the cells. In order for nervous impulses to pass from cell to cell, the periods of oscillation of their surface film must be synchronous. Asynchronous periods are rendered synchronous during learning by simultaneous stimulation of the membranes which are later to become tuned to each other. This theory is of interest chiefly because it supplies a hypothetical basis for chronaxie alteration, which is sometimes suggested as a basis for association." 5

These proffered theories attempt to account in many different ways for the lowered resistance at the synapse.

They are all hypothetical, having no experimental basis whatever.

Kappers has postulated a theory of neurobiotaxis. This theory assumes the growth of new axones and dendrites as a result of the action of bio-electric currents among previously existing nerve fibers. These electric currents are occasioned by the differences in electrical potential which result from neural excitation. The electric current causes the axones of the new fibers to grow toward the cathode and the dendrites toward the anode. When nerve impulses pass over these new nerve processes, the excitation occasions the growth of still other neurones. This would seem to account for the multiplicity of nerve structures but it fails to explain the growth of the original fibers whose excitation occasioned the growth of further structures. Furthermore, there are experimental data to prove that these neural structures develop normally even when anaesthetized to prevent stimulation.

Many writers have suggested that some fundamental change within the neural structure will account for modification. Verworn believes that changes in size of the nerve fibers

occur with stimulation and that the intensity of the impulse is determined by the size of the fiber that discharged it. Others have suggested that changes due to chemical disturbances are the occasion of modifiability. Though this postulation as stated has little basis of fact at the present time, yet a real solution of the problem may be found to involve the low metabolic changes which have been found, more or less recently, to exist upon excitation of nerve structures.

8

Ebbecke has attempted to account for memory on the basis of a theory of after discharge of nerve fibers resulting from stimulation. This after discharge, or remaining excitation, persists to some degree and offers a theoretically plausible theory of memory traces.

Thus far, all theories here reviewed have been based upon localization of function within specific neural structures. There are students of the problem who reject all such theories of localization, proposing to account for learning phenomena in other ways. Loeb and Weiss conceive the mechanism of integration to be due to the periodicity of the nerve discharge of impulses, thus assigning to the motor systems varying excitation times

9. Loeb, J., Comparative Physiology Of The Brain And Comparative Psychology, 1902.
(chromaxie), making them sensitive to varying frequencies of stimulation.

Lashley, by extensive experimentation, has proven that the engram, or memory trace, is not strictly localized anatomically. On the basis of his laboratory findings, he has offered a hypothetical theory of learning which is based upon Child's concept of the physiological gradients.

"The adequate stimulus...is not the specific cells activated, but the pattern of excitation which may shift over the sensory surfaces and likewise over the cortical field. In such a pattern the relative intensity, distance of separation, and frequency of excitation seem to be the only constant factors, determining in turn the direction and steepness of gradient of electrical and chemical processes within the system... The principles to which I have appealed in the foregoing sketch, the production of gradients of activity and their influence upon organic processes, the development of stable patterns of interference in the transmission of different forces through a homogeneous matrix, are as well established in biological thought as are the principles of conduction within the nerve fiber or the interaction of nervous impulses within a spinal center... The evidence seems conclusive that in various cortical functions there is every degree of specialization from a limited point to point correspondence of cells to a condition of absolute non-specificity. Not only is there diversity in the modes of action of the different parts of the cortex but a single area, highly specialized and differentiated for one activity may be wholly undifferentiated with respect to another in which it also participates." 11

The conclusion to be reached from a study of the biological bases of learning is that, so far, there is no

proved positive theory. A great deal of research has proved what learning is not, but as to what it is, only hypotheses can be formulated. The meaning of this to education is clear. Those who are being trained to teach should realize that a large portion of our procedure in teaching is empirically derived; that is, it has been found to work in practice. This does not necessarily mean that it is the best method or procedure. It will be on the basis of extensive experimentation only that we shall arrive at the superior way of doing anything. It is essential that the teacher have an open mind and that she have sufficient plasticity in her attitude and method to modify procedures whenever proved facts indicate the necessity for such modification.

Brief but comprehensive accounts of the principal theories of the physiological mechanism of learning are available.

12. Matthaei, R., "Von den Theorien über eine allgemein-
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CHAPTER III

THEORIES OF LEARNING

Bond Theory. Perhaps the most important contribution which associationism has made to education has been the association theory of learning, more commonly known as Bond Theory. Since associationism was the basis of the earlier psychology, Bond Theory became the psychological basis of learning. The influence of this theory is apparent in the materials and methods of teaching today.

The name of E. L. Thorndike is best known as the exponent of the Bond Theory of learning because of his interest and his extensive and thorough experimental attack upon the problem. The following will be confined to Thorndike's views, more particularly those that have been expressed in his later writings. In his earlier works, Thorndike postulated three major laws of learning: Law of Readiness, Law of Exercise, Law of Effect; and five subsidiary laws: Analogy, Piecemeal Activity, Associative Shifting, Mental Set, and Multiple Response. At that time these laws were defined as follows:

"The Law of Readiness is: When any conduction unit is in readiness to conduct, for it to do so is satisfying. When any conduction unit is not in readiness to conduct, for it to conduct is annoying. When any conduction unit is in readiness to conduct, for it not to do so is annoying. By a
satisfying state of affairs is meant one which the animal does nothing to avoid, often doing things which maintain or renew it. By an annoying state of affairs is meant one which the animal does nothing to preserve, often doing things which put an end to it. 1

"The Law of Exercise comprises the laws of Use and Disuse. The Law of Use is: When a modifiable connection is made between a situation and a response, that connection's strength is, other things being equal, increased. The Law of Disuse is: When a modifiable connection is not made between a situation and a response during a length of time, that connection's strength is decreased. 2

"The Law of Effect is: When a modifiable connection between a situation and a response is made and is accompanied or followed by a satisfying state of affairs, that connection's strength is increased. When made and accompanied or followed by an annoying state of affairs, its strength is decreased. 3

"Multiple response to the same external situation. The animal reacts to being confined in the pen in several ways, and so has the possibility of selecting for future connection with that situation one or another of these ways. 4

"Set or Attitude or Adjustment or Determination. The principle that in any external situation, the responses made are the product of the 'set' or 'attitude' of the animal, that the satisfyingness or annoyingness produced by a response is conditioned by that attitude, and that the 'successful' response is by the law of effect connected with that attitude as well as with the external situation per se—is general. Any process of learning is conditioned by the mind's 'set' at the time. 5

2. Ibid., p. 2.
3. Ibid., p. 4.
4. Ibid., p. 12.
5. Ibid., p. 13.
"Law of Partial Activity - that a part or element or aspect of a situation may be prepotent in causing response, and may have responses bound more or less exclusively to it regardless of some or all of its accompaniments." 6

"Law of Assimilation or Analogy - to any situations, which have no special original or acquired response of their own, the response made will be that which by original or acquired nature is connected with some situation which they resemble. 7

"Law of Associative Shifting - we may...get any response of which a learner is capable associated with any situation to which he is sensitive." 8

At the present time we find that Thorndike has greatly modified his views as a result of his experimentation. He is still an associationist and in this he has not changed his position. In this connection, he says:

"But we have tried to work out and present a reasonable solution as far as is possible from existing knowledge. This solution takes the form of a new associationism, or better, since it differs deeply and widely from that older British associationism, of a new Connectionism." 9

According to this new connectionism, bonds or connections are formed between a situation and response, or between the "element of a situation and feature of a response". Thorndike defines a connection in this way:

"That a connection S-R exists in a certain organism means in this study that there is a probability greater than an infinitesimal that

7. Ibid., p. 15.
8. Ibid.
10. Ibid., p. 18 (Note).
If $S$ occurs, $R$ will occur. In practice, very low probabilities, say of less than .0001, will not be called connections. The most generally accepted and acceptable meaning for the strength of a connection with $S$, say of $S - R$, is the probability that $R$ will occur if $S$ occurs.\textsuperscript{11}

In his new viewpoint we find Thorndike eliminating one of his major laws, modifying his definitions and emphasis on others, and offering several new concepts, which, in all probability, were responsible for his admission of a "new connectionism". The law of exercise, as such, is noticeably conspicuous for its absence. In his book, \textit{Human Learning}, Thorndike definitely proved, on the basis of experimental findings, that repetition of an act alone will not establish bonds or connections with the stimulating situation. It must be bonds plus something else. "The repetition of a situation may change a man as little as the repetition of a message over a wire changes the wire."\textsuperscript{12}

In the same connection he says:

"All educational doctrines which attach value to experience or activity as such, irrespective of the direction of the experience or activity and of its consequences, are made less acceptable than before."\textsuperscript{13}

Exercise is dependent upon effect and belongingness to be efficacious in forming and strengthening bonds. The law of effect has been the most contested of all of Thorndike's proposed laws. The psychological literature is filled

\textsuperscript{11} Ibid., p. 19.
\textsuperscript{13} Ibid., p. 15.
with the pros and cons of this concept. The fact that in order for this law to operate it must work backward in forming bonds has offered the greatest difficulty in its acceptance. Thorndike himself has recognized this.

With regard to the law of effect itself, he has modified his views:

"I do not now accept the Law of Effect in this precise form (Thorndike, E. L., Educational Psychology, Vol. II, p. 4). Its suggestion that the action of annyoers is the opposite of that of satisfyers in all respects is misleading. As we shall show in a later chapter, there are very important differences. Also, the closeness or intimacy of association is conditioned by the facts of belonging in general, as well as by attentiveness to the situation, response, and satisfyer. Since, however, the Law of Effect is the accepted term for a general affirmation that satisfying and annoying after-effects of connections influence them, it seems permissible to use it. As regards satisfyers, the two essential features are that certain events which occur after a connection has operated can work back upon it to strengthen it, and the assertion that satisfying events are the kind which have this power." 15

Many critics of Thorndike’s Law of Effect have emphasized the pleasure-pain aspects which they have assumed were embodied in the law. These criticisms are hardly to the point since Thorndike has emphasized his position in this respect several times.

"A large percentage of the states of affairs which are satisfying or annoying are so not because they contain emphatic sensory pleasures or pains, or because they bring general joys.

15. Ibid., p. 176."
contentment, depression, irritation, or the like to the mind as a whole, but because they satisfy or thwart some particular purpose. The appearance of a satisfaction or annoyance is, then, very often proof of the existence of a purpose." 16

— The principle of belonging or "this goes with that" plays an important role in the operation of all other laws. It has much to do with the attentiveness of the learner for no matter how much two things went together, if the learner were not aware of the togetherness, the principle could not operate. The term itself is a relative one and is far removed from any suggestion of the precision of the former laws.

Two other laws or principles which operate in learning are the identifiability of the situation and the availability of response.

"Other things being equal, connections are easy to form in proportion as the situation is identifiable, distinguishable from others, such that the neurones can grasp and hold and do something with or to it." 17

Availability is concerned with the "get-at-ability of the response". "Other things being equal, connections are easy to form in proportion as the response is available, summonable, such that the person can have it or make it at will." 18

These two principles have to do with the potentialities of

16. Ibid., p. 397.
17. Ibid., p. 343.
18. Ibid., p. 345.
the individual with reference to the stimulating situation. If these principles can operate, then learning may take place regardless of any awareness of the learner beyond the effect of the identifiability and availability in the situation. "The scientific control of connection forming with an identifiable situation and an available response involves only the straightforward application of the laws of belonging and effect."

The principles of "set" or purpose, readiness, piece-meal activity, multiple response or varied action, and associative shifting stand much as they were in Thorndike's earlier work. His views at the present time are broadened perceptibly as contrasted with his earlier views and he seems to indicate that he is aware of the relative character of all of these principles and their operations. There seems to be a shift of emphasis away from the "element of the situation and feature of the response" toward the individual organism, its capacities and present condition.

We have, therefore, selected and established the basic laws or principles upon which Thorndike has built his psychology of learning. For our subsequent comparison we shall accept them as (1) Readiness, (2) Effect, (3) Belongingness, (4) Availability of Response, (5) Identifiability of the Situation, (6) Partial Activity.

19. Ibid., p. 352.
Conditioned Response Theory. When John B. Watson formulated his system of psychology known as Behaviorism in 1913, he stated his position very clearly that psychology, to be a science, must be objective and should be patterned upon the science of biology. In his approach to the study of the organism, he stated that only those aspects of behavior that could be objectively studied and measured would be embraced as a part of Behaviorism.

Watson, as every other sponsor of a psychological school, was faced with the necessity of promulgating or embracing a theory of learning, or habit formation as he prefers to call it. His theory, of necessity, must provide for an objective approach and must needs be stated in simple behavioristic terms. For his purpose, the phenomenon and theory of the conditioned response as stated by Pavlov was convenient and adequate. As a result, he took over this theory and proceeded to build a complete system of habit formation upon it.

"The behaviorist's psychology is based upon reflexes such as the neuro-physiologist studies... Let us assume...that there are at birth a large number of ontogenetic, embryologic responses or 'reflexes'... Even if there were only a hundred to start with (and there are many thousands) the process of 'conditioning', working according to the law of permutations and combinations, would establish many millions of total responses - a far greater number than the environment ever
calls on the most versatile human being to make." 20 "In this way, which may seem a little complicated unless one is familiar with the establishment of conditioned responses, the Behaviorist tries to take the old vague concept of habit formation and to give it a new and exact scientific formulation in terms of conditioned responses. On this basis the most complicated of our adult habits are explicable in terms of chains of simple conditioned responses." 21

From these statements, we find that Watson conceives the human organism as possessing certain reflex responses to unconditioned stimuli at birth. Upon these, by the process of conditioning, other responses are built up in the process of habit formation until, in the adult, we find the most complicated and involved behavior. That this elaborated behavior could be traced back in the order of its evolution to an original reflex arc, is theoretically possible according to Watson's theory.

"The term reflex is a convenient abstraction in both physiology and behavior... We mean by reflex, when used in this way, that action takes place under appropriate stimulation in some fairly circumscribed glandular or muscular tissue. It is an abstraction because reflex action in the eye, the leg, hand or foot can never take place in isolation. Action is altered in other parts of the body as well... The clinician and the physiologist, however, are not interested for the moment in action in any part of the body other than in the particular motor organ which is under observation... The term reflex, however, is an extremely convenient one and by it we mean the

21. Ibid., p. 25.
simplest type of activity that can ordinarily be produced." 22

In this position with respect to the reflex concept, Watson is entirely in accord with Sherrington and Dewey.

After Watson had established his general theory of learning upon the conditioned response principle, he was forced to go further and affirm the conditions under which these primary reflexes could be built into elaborate systems of behavior. Generally, it is stated that the laws of recency and frequency were operative in conditioning the earlier modes of behavior into complex habits.

Actually, Watson added four relative principles to the laws of recency and frequency.

"In view of the fact that there are so many responses possible, the question as to which will appear upon the incidence of a given stimulus becomes one which we must consider. We can answer this only in a general way and in probable terms.

"1. The response most likely to appear is the one which was most recently called out by the object.

"2. When recency is not pertinent the act which has been most frequently connected with the object is the one most likely to be called out.

"3. The act called is likely to be one which is most closely connected with the general setting of the situation as a whole...The situation as a whole envelopes us and each object in that situation can call out for the time being only a narrowly appropriate

and conventional type of act.

"4. The most important determiners are the situation which the individual has had to come up against during the hours preceding the incidence of the stimulus to which he must now react, and the amount of emotional tension those previous activities have aroused.

"5. Temporary intra-organic factors tremendously influence our reaction.

"6. The most important determiner, of course, is the life history of the individual in the sense that his general and special training, illnesses, disappointments, hobbies, family training, and the like develop within him definite attitudes, trends, or slants." 23

Watson's concept of learning as based upon the conditioned response operating through recency and frequency is obviously an oversimplification of the learning process. The other postulations which he has made with reference to the unconditioned stimulus and the state of the individual render his theory a highly complex process. However, in his general discussions of habit formation, he does not elaborate at any great length upon these relative conditions as perhaps they do not fit very well into his principle of objective approach. For this reason he has merited the general criticism of oversimplification in his theory of habit formation. Regarding such an attempt to simplify the learning process, Forbes says:

"The difficulty arising from the complexity of organisms is due largely to the attempt to make

23. Ibid., p. 299.
excessively simple explanations fit the behavior of structures whose intricacy should warn us at the outset of the improbability of finding any complete explanation with the means at our disposal. Clearly, with many millions of nerve cells in the gray matter, each representing a bewildering array of branching fibers for connection with other cells, there is room for prodigiously complex activity through the mere factor of arrangement, even if the underlying activity is always the same in kind."

Watson's theory is definitely atomistic and is based upon associationism. The conditioned response is "nothing more than a special case of association by contiguity, which principle has been recognized since the time of Plato and Aristotle" according to Hull. Whether it was Watson's intent to follow the principles of association or not, he might well have anticipated such criticism when he wrote:

"The relationship, theoretically between the simplest cases of the conditioned responses we have studied and the more complicated, integrated, spaced and timed habit responses...seems to me to be quite simple. It is the relationship apparently of part to whole—that is, the conditioned reflex is the unit out of which the whole habit is formed." 26

To this Williams has added:

"Not only this, but the integrating, patterning, timing, seem themselves to be processes of conditioning. It is apparently correct to say that the linking of a simple reaction to a simple stimulus, the linking of simple reactions to each other to form a complex response, and the linking

of a complex response, such as a habit or emotion, to any stimulus, are all cases of conditioning. In a word, conditioning becomes synonymous with learning."

Our conclusion in establishing those fundamental principles upon which Behaviorism has built a theory of learning is that the simple primary reflexes are built up into elaborate habit systems by means of the conditioned response phenomenon, the activating principles being recency and frequency. In subsequent comparisons, Watson's statements with regard to the relativity of the unconditioned stimulating situation and the state of the organism will receive consideration.

**Gestalt Theory.** Gestalt theory is a departure from the traditionally accepted viewpoint in psychology and it has given a new emphasis to certain concepts which in themselves are not altogether new. Many writers, previous to 1912, had observed the totality of human behavior but it remained for the Gestalt school to found an entire system on this concept. This school is deliberately and intentionally opposed to associationism as such. Fundamentally, it is based upon the organismic view that would account for the simpler modes of behavior in all organisms in terms of the complex; that is, the parts in terms of the whole. Associationism recognizes the individual as an organism.

which responds at all times as a whole, but it claims that every whole piece of behavior is made up of a great number of behavior units or elements. Gestalt theory states that the whole is not made up of parts, that the whole is always more than a sum of its parts. The organismic view claims also that not only does the individual respond as a whole in every situation, but he always responds to and in relation to the total situation.

There is a large body of research, at the present time, in the fields of neurology and physiology which gives much weight to the organismic viewpoint. The work of Child, Herrick, Lashley, Coghill, Lickley, and others bears directly upon this viewpoint from the biological approach to the study of organisms. It has been shown experimentally, that from the earliest period in the life history of an organism, when it was in the undifferentiated protoplasmic state, development, both structural and functional, was a matter of the growth of the total organism. From this total growth pattern, smaller growth patterns emerge or individuate, but they exist only in relation to the larger whole. In regard to this, Coghill says:

"The organism appears to be the expression of an integrating and ordering institution which originates in the most general relations and reactions of living protoplasms to environment. The organism is inconceivable except in relation to environment, and that means that it is inconceivable except in terms of behavior. Integration is not the mere aggregation of units, but rather the development of definite relations.
between them. The relations, not the parts, are the real integrating factors." 28

(Physics likewise has contributed both concepts and terms to the Gestalt statement.) The human organism is a system of energy following the laws of energy in its behavior. The natural state of this organism is a state of equilibrium and it is assumed that there is "in the nervous system an interplay of forces analogous to the kind of dynamical interaction which, without special structure to restrict its paths of action, produces organization in the atom and in the solar system." The nervous system must be considered as a whole shifting pattern of strains and stresses, the immediate condition of any one part of which is determined by its relation to the whole. When the organism or field of energy is in a state of disequilibrium, it will follow the law of least action or parsimony in order to reach a state of equilibrium in the shortest time possible. According to Wheeler,

"When the organism's position with respect to the stimulus-situation is such that the forces acting upon it are balanced with forces within it, equilibrium is reached." 30

"The growth of the nervous system, insofar as it has been definitely correlated with the develop-

ment of the behavior pattern, demonstrates that fractional patterns (reflexes) arise by a process of individuation within a primarily integrated total pattern, and that the latter does not arise by an integration of independent reflexes. The form of the behavior pattern in Amblystoma up to and including locomotion is determined by specific neural counterparts that acquire their specificity in functional value through laws of growth in the nervous system. There is evidence also that mechanisms that condition the performance of such a behavior pattern as locomotion in mammals are determined in the same manner. It is important, therefore, to know how far growth, in the sense of the differentiation of new functional parts of cells, is projected into the life-history of the vertebrate, for so long as it continues it must participate in the function of the nervous system as a whole and, therefore, in the development of the behavior pattern. 31

Since Coghill has demonstrated the correlation between developing structure and function within the organism, it seems reasonable to believe that the psychological manifestation of the functioning nervous system should bear a positive relation to that function; that is, behavior may be considered as a configuration in which the parts are secondary to and related to the whole.

The contribution which Child has made in his postulation of the physiological gradient is important to the Gestalt position. Physiological gradients are the "differential rate of activity" within the organism and they are "due to varying rates of metabolism, arising

through the differential action of external energies upon the inherent potentialities of the organism." The gradient is directly concerned with the behavior patterns of organisms which are due not to connections or bonds, nor to fixed or rigid pathways, but are developed by dynamical interaction of changing stresses and strains, by ratios of excitation from the environmental situation acting upon a dynamic field.

The principles of Gestalt psychology are so broad and far reaching that their true significance has scarcely been realized. To many students of psychology, this breadth is an indication of its lack of value to science. However, as Whitehead has said:

"If you have had your attention directed to the novelties in thought in your lifetime, you will have observed that almost all really new ideas have a certain aspect of foolishness when they are first produced." 33

We conclude that the difficulty lies in grasping an entirely new departure in thought when one has been grounded in the synthetic or analytic viewpoint in science.

The problem of learning has received consideration from the better known Gestalt psychologists. More particularly, the problem has been considered in its broad and theoretical aspects, rather than in its application to

32. Freeman, C. L., An Introduction To Physiological Psychology, p. 491.
the details of educational procedure. To the Gestalt psychologist, learning is that modification which occurs within an organism when organization or reorganization of a perceptual field occurs. The immediate cause of organization lies within the organism in the form of a tension, a state of disequilibrium, and the remote cause lies within the perceptual field where effective organization will bring the organism back into a state of equilibrium.

The human organism is first assumed to possess the property of irritability or excitability. This is not an unwarranted assumption since irritability is accepted as a property of protoplasm. Without this property the differential energies of environmental media could in no wise affect the organism. Likewise, it is assumed that each organism is possessed of a growth potential, the achieving of which is a matter of maturation.

"Development is a process of functional construction: that is, beginning with a given structure and function, continuance of function modifies the structural substratum, and this in turn modifies further function, and so on." 34

This statement illustrates what has been heard and thought for some time, that an organism can not be conceived except in relation to an environment, a figure in relation to a ground. Learning, therefore, becomes a matter of achieving degrees of maturation as a result of stimulation.

It is the progressive realization of the inherent growth potential.

In the animal series, there are certain drives or needs, purely physical apparently, which are the cause of activity which seeks to find within the external environment something which will meet the needs and return the animal to a state of equilibrium or released tension. In human beings many, perhaps all, of these primitive drives and needs are present. They have become modified in man and in addition to these, there are countless purposes that have evolved with the more intricate relations of the social inheritance, until man can be motivated upon higher and higher levels depending upon how nearly he has approached the limits of his growth potential. These needs are fundamental to the survival of the individual, both physically and socially; and their existence within the organism causes certain tensions. The strength of these tensions will, in reality, determine the strength of the organism's purposes. In regard to this, Koffka says:

"Before a subject is confronted with a stimulus, the structure that will eventually ensue must be prepared for by a mental attitude, and this attitude consists mainly in a readiness to carry out a certain structural process." 35

A tension is a state of disequilibrium which occasions

activity of a more or less restless sort, and it pre-
supposes a goal to which there is an obstruction. The
attainment of this goal becomes the means of resolving the
tension and here a perceptual field appears, the successful
organization of which will mean achieving a state of
equilibrium. In the first stage of field organization
there is goal anticipation. The organism responds, from
the first, to the field as a whole. It is a total con-
figuration but gradually, or perhaps immediately, some
detail will become a focus, or it will appear by the
process of individuation, a figure on a ground. It becomes
the critical point in the organization of the field; that
is, in the solution of the problem. In the process of
organization, the organism will follow the law of least
action according to the level of maturation which it has
achieved. When the field is structured effectively the in-
dividual has evidenced "insight" into the situation and
"closure" takes place when the goal is achieved. Closure
means achieving a state of equilibrium. Sherbon states that
there is a universal cosmic tendency in thinking which
manifests itself in closure, patterned grouping, and
organization.

"This brings us to the second organismic principle,
namely that there is a universal cosmic tendency
toward organization. The elemental atoms form
molecules, the molecules form crystals and com-
 pounds; star dust coheres to form worlds and solar
 systems. We have seen the elements of the earth
 struggle toward patterned complexity in life forms."
Isolation or fragmentation is non-typical and chaotic everywhere—in solar space, in living forms, or in thinking. The configuration psychologists tell us that closure, patterned grouping, organization is a fundamental compulsion in thinking, no less than in physical growth, heredity, crystal formation, or the grouping of a solar system." 36

Kohler, in defining insight, says:

"It does not mean more than our experience of definite determination in a context, an event or a development of the total field; and in the actual cases there need be nothing like an invention, or a new intellectual achievement or so forth." 37

Insight means why and how. Wheeler has included the principle of transposability as one of the criteria of insight. Transposability means the transfer or recognition of certain relations in an organized field into a different field which possesses the same relations. A melody transposed from one key to another is familiar though it may not contain a note identical with the original melody. The relations between the notes, however, remain the same. Transposability illustrates well the fact that human reactions to situations are reactions to relationships which exist between the various members of the situation: the principle of configuration.

With regard to insight, Koffka, also, says:

"The sudden grasping of the solution which results is a process that runs its course in accordance

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37. Kohler, W., Gestalt Psychology, p. 371.
with the nature of the situation, so that the complete solution of the problem takes place with reference to the configuration of the field of perception, and this is what Kohler maintains to be the criterion of insight." 38

(Closure and insight are complementary concepts. When insight is achieved and a solution of the problem situation is reached, closure takes place.) Without insight, there is no solution and a tension persists.

The fact that tensions persist in uncompleted tasks, or unorganized fields, is substantiated by Lewin's experimental findings. Pachauri says that: "Kurt Lewin has maintained that the non-completion of a task facilitates its retention and subsequent recall twice as strongly as does its completion." This is the experimental counterpart to Kohler's theoretical statement that "if the work is interrupted before the solution, the trace of this situation contains that stress." The temporal factor would be significant undoubtedly in affecting the persisting tension resulting from an uncompleted task. However, the fact that a tension will persist under these conditions gives weight to the concept of closure.

40. Kohler, W., Gestalt Psychology, p. 331.
Since the Gestalt psychologist has rejected all of the theories of bonds and conduction units, the problem of memory or retention, and reproduction must be accounted for in other ways. Kohler indicates clearly the Gestalt view:

"From our viewpoint, association is given up as a special and independent theoretical concept. It is not more than a name for the fact that organized processes leave a trace picturing their organization and that in consequence of it reproductions are possible. I do not deny that repetition will make the association stronger, but as long as the process remains the same, repetition does not involve a change in a special bond; it means that the whole trace of the organized process becomes more enduring and stable. Nor shall I deny that sometimes, as in the case of nonsense material, some special attitude is needed for producing an association. But, as we have seen before, such an attitude consists in favoring definite organizations. When these are experienced, the processes corresponding to them will also be organized, and so will their traces." 41

An organization trace can in no sense be conceived as a point-to-point relationship between the sensory pattern and the central pattern. An organization trace means a dynamic and shifting ratio of excitation which the evidence, at the present time, would indicate need not be over the same nerve pattern in similar situations. The fact of importance here is that Kohler supports a theory of traces to account for retention and recall.

[The conclusion of this study of the Gestalt theory of learning is that the principles of irritability, matura-

41. Kohler, W., Gestalt Psychology, p. 292.
tion, needs, tensions, goals, insight, transposability, closure, and pattern organization traces represent the process by which all organisms become modified functionally. As Lewin has said: "It is coming to be realized that every psychological law must hold without exception", it is claimed by Gestalt theory that these principles will account for every case of learning and for every type of learning. For subsequent comparisons they will be accepted as here stated.

CHAPTER IV

SIMILARITIES AND DIFFERENCES IN
THEORIES OF LEARNING

The principles of "laws of learning" which have been taken directly from Thorndike's later writings, from Watson's statement, and from the contributions of Kohler, Koffka, Lewin, Ogden, and Wheeler have been studied comparatively. There has been no thought or purpose of showing, for example, that Thorndike has, in reality, a leaning toward the Gestalt viewpoint. In this, the writer differs with Brown and Feder when they state:

"We believe that in his latest writings Thorndike, himself long one of the staunchest supporters of psychological atomism, self-styled a connectionist, has unwittingly gone over to the other side. Our specific aim in writing this paper is to show that Thorndike's theory of learning could be successfully rewritten in terms of Gestalt psychology without serious modification of the tenets of either." 1

Thorndike, like Watson, has made his position so clear with regard to his basic concept of connections that it is difficult to see how his true position could ever be restated in terms of Gestalt theory.

"I read the facts which psychologists report about adjustments, configurations, drives, inte-

Grations, purposes, tensions, and the like, and all of these facts seem to me to be reducible, so far as concerns their powers to influence the course of thought or feeling or action, to connections and readinesses. Learning is connecting. The mind is man's connection-system. Purposes are as mechanical in their nature and action as anything else is.

"There is nothing beyond or above connection forming. Elements are made to stand out in relief and arouse response irrespective of their context by the action of use, effect, piecemeal activity, and preferential connections. The force at work is not some transcendental faculty of analysis or insight or abstraction, but a tendency of situations to act piecemeal and a multitude of connections so marshaled as to strengthen the connection leading from an element to some preferential response and to weaken all other connections leading from it."

Regarding anyone who takes such a positive position as Thorndike, MacDougall quotes Professor Graham Kerr as saying:

"It is of the very essence of scientific method that a working hypothesis must never be allowed to crystallize into dogma. There is always a danger of this, for the mind of the investigator tends to be dominated, instead of being merely inspired, by the working hypothesis of the day."

There is, however, one fact in a comparison of these theories which is altogether evident. These writers have been observing the same phenomenon in their study of learning, and no matter what their scientific bias may be, whether it be analytic, synthetic, or neither, they have stated their findings often in terms that indicate identical concepts. There seems to be a tendency among critics and

students of these theories to take the relative postulates of an orthodox associationist and use them as evidence of a viewpoint, of which the associationist is not aware. This practice cannot be defended for it seems only fair to accept the position which any writer claims for himself. Therefore, it is stated here again, that in contrasting these various principles the purpose is to show that the phenomenon of learning is much the same however observed and interpreted, and no inference is made to indicate identical viewpoints by the various writers.

The law of readiness has reference to the state of the organism as it faces the learning situation or perceptual field. This seems to be the same factor which Gestalt psychology recognizes as the existing needs which produce tensions within the organism. Likewise, Watson found the same factor in the form of emotional tensions and intra-organic factors which influence the reactions of individuals. Along with the principle of readiness, mindset is closely related to the concept of goal anticipation. Attitudes and attention have long been known to influence and direct our activities, and in this connection Kohler speaks of "lines of force" and "bipolarity" with reference to the individual and the perceptual field. The same concept is embodied in Hull's "goal gradient hypothesis", in Lewin's field vectors with their respective valences, and in Tolman's "demand value" of objects in the perceptual
field. Whatever the statement of the fact may be, the organism is observed as in a condition of tension (sensory or motor, probably both) and it is faced with a field which will meet the need of the organism if it can be effectually organized. This organization becomes the goal. The fact that this goal goes with this tension, or the fact that this stimulus goes with that response, means that there must be certain relationships established within the field. This is the principle of belongingness operating in the organization of the field. Watson likewise recognizes these relationships when he states that the act that will be called out will in all probability be the one that is most closely connected with the general setting of the situation-as-a-whole. It is evident that without the establishment of the proper relationships within the field, the goal can not be realized and the anticipation or tension will persist.

That the situation must be identifiable to the organism would mean that it must be possible for the organism to establish the relation between the need and the goal. If the field situation confronting the individual were beyond its perceptual potentiality, the relations could not be established since the situation could not be identified with reference to the existing need. Likewise, the response which is required must be available to the organism; or, in other words, the organism must have achieved
the degree of maturation which would make it possible to respond in the effective way. If the field were too complex for the maturative level of the organism, no organization could be achieved.

The principle of partial activity operates in the organization of a field by individuation. During the process of organization, a certain aspect or element of the situation may emerge in its relation to the entire field as the key to the situation, and the organism will proceed to the realization of the goal by the law of least action. Least action does not necessarily mean the shortest or quickest means possible to the goal. It is the shortest and quickest means which an organism can achieve at its maturative level. When repeatedly facing a similar situation, an organism may achieve greater efficiency in reducing time and distance as it progresses to higher and higher levels of maturation. Watson, in writing of the importance of the life history of the individual, of the attitudes, trends, and slants which his general and special training had developed within him, was undoubtedly recording his observations of the degree of maturity which the individual had achieved to date.

The law of multiple response is basic to Thorndike's concept of trial and error learning, or as he prefers to call it trial and success learning. Apparently, to Thorndike, all learning is by means of trial and error procedure.
If a field is too complex for the maturity level of the organism and he cannot achieve organization of the field immediately there will be a shifting from this response to that in an effort to succeed. "Chance and insight are by no means opposed to one another, for insight frequently comes through the employment of chance." Huenzinger has suggested that cumulative insight occurs when there is a grasping of the temporal sequence in such a situation. He contrasts this type of insight with functional insight in which there is an immediate perception of the relationships existing within the field.

The law of analogy states merely that a new field will be effectually organized if it has some resemblance to another previously organized field or that certain elements in a previously organized field will, if present in a novel situation, assist in the organization of the new situation. Koffka states that:

"...to release a thing from one configuration and transfer it by reconstruction into another configuration, would seem to be a relatively high-grade accomplishment." 6

Associative shifting seems to be a statement of the general principle of the conditioned response. From the Gestalt viewpoint it is a narrowing of the perceptual field

by individuation until the configuration is extremely limited. It is, however, a perfectly well organized field which has all the characteristics of a Gestalt. Coghill gives support to this contention when he states:

"These dogs (Pavlov's) which begin their response to the conditions of the experiment with virtually total reaction may eventually condition their reflexes appropriately. This appears to be accomplished by establishing a balance between inhibition and excitation which permits the emergence of the conditioned reflex. This balancing of inhibition and excitation is exactly what occurs in the genesis of unconditioned reflexes as I have seen it in Amblystoma. I conclude, therefore, that the conditioned reflex, like the unconditioned is acquired by analysis of a total pattern which under normal conditions is from the beginning perfectly integrated."

The law of effect reveals the operation of the principle of insight in which there is a resolution of the existing tension and closure takes place. In this connection, Koffka says:

"A successful activity (that is an activity which brings something I desire or one that achieves what it should) brings me pleasure, whether the end attained be itself pleasurable or not... There can be no doubt that the pleasure taken in an achievement operates as an incentive to new achievements." 8

To an organism that is conceived as a dynamic field of energy, the natural state of which is a state of equilibrium, the law of effect means achieving that state of equilibrium. This is possible only through the realization of those

goals that will release or dissolve existing tensions.

The principles of recency and frequency have no place in a system of Gestalt psychology. Since "learning always involves some new achievement", recency can not possibly operate. Furthermore,

"....after the configuration has once been constructed, repetition serves to make the behavior appreciably firmer and easier - but not before... In general, what we mean to say is that in order to be learned the material must first receive some kind of figure, every facilitation in the construction of which is a facilitation of learning." 10

It is clear, therefore, that frequency can be effective only after learning or organization has taken place. It is not an aid to or factor in learning.

The conclusions concerning the similarities and differences in the theories of learning here contrasted have been stated in the beginning of this section. Learning at all times, manifests itself as the same phenomenon with the same factors operating to account for the process. The personal scientific bias of the writers has influenced their descriptions and explanations, but the basic facts, to a large degree, remain the same.

Adequacy of Theories in Explaining the Learning Process.

When subjecting these theories to test for the purpose of determining their adequacy in explaining the phenomenon of

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10. Ibid., p. 233.
learning, it seems to be either a personal matter of choosing between beginning with parts or with wholes; or else the weight of physiological and neurological research must serve in making the choice. As stated before, it is difficult to conceive a physical organism which develops structurally by the process of integration and yet whose behavior functionally is built up of parts or units. Not only is this true but there are certain procedures and theories in education, at the present time, which have been found empirically to be sound. There has been no theoretical basis for the soundness of these practices except that they have been found to work in practice. Seagoe states:

"Recently the hoary whole-part problem has arisen to importance because of two developments, one in the field of educational philosophy reflected in educational method, and the other in psychology proper. The first is the progressive education movement, the second, Gestalt psychology. Yet along with the Dewey concepts in educational theory are taught Thorndikian concepts of the learning process, without any apparent recognition of their fundamental incompatibility or of the promise of Gestalt psychology for a resolution of the difficulty." 11

In spite of the fact that Thorndike is carrying on extensive research in a "new connectionism", and that there are psychologists who believe, at the present time, that the conditioned response is all that is necessary to account

for every type of learning, there is a mass of evidence accumulating from several sources to indicate that Gestalt theory is fundamentally sound. It will be necessary to approach the practical problems in education with well-defined and scientifically conceived postulates, and these must be subjected to rigorous experimental study, preferably in the classroom.

"We must be prepared to study the phenomena of human behavior with the same minute interest in structured form which the discipline of embryology and anatomy demand. The way is long and tedious, but the scientific footing is solid." 12

It will be only in the face of fact that ultimate conclusions can be drawn. Until that time the best that can be done is to decide on the basis of present evidence which approach is the most justifiable. The unquestionable validity of the research in the field of biology is such that the writer is inclined to believe that the most promising approach to the problem of learning, at present, lies in the Gestalt theory.

Within recent years, there seems to be a new advance in the study of developmental psychology. The child, now conceived as an individual, every phase of whose existence is considered equally important, is assuming a position of major importance in the experimental field. Psychoclinics, bureaus of child welfare, treatises and books, -- all bear witness to the new emphasis and increasing importance attributed to the developing organism known as the child.

According to Gestalt theory, education means maturation, not maturation of one type but of every type. For the purpose of convenience largely, we think of an individual as possessing intelligence, emotions, will, imagination, motivations, attitudes, interests, etc. These are, in fact, manifestations of the total individual, all of which are present to some degree in every moment of the lifetime of the individual.

The human organism is a perfect example of a Gestalt, a configuration, a figure upon a ground. What else is a personality but a figure which emerges with more or less consistency and clarity against the background of the
situations to which it reacts? Every organism is possessed of a growth potential, the complete realization of which depends upon the stimulating conditions which surround it. Just so with the human organism, if it is to approach the realization of its growth potential, the most favorable conditions should be provided for the maturation which it can potentially achieve. Education, therefore, becomes the process of selecting, arranging, and presenting the favorable environmental fields which will make of the organism an integrated figure emerging against the ground of life situations with which it is surrounded. Furthermore, this figure will bear a definite and wholesome relationship to the entire field which means that it will be an integrated personality which has achieved every type of maturation of which it was potentially possessed.

According to Gestalt theory, the organism is functionally as well as structurally more than a sum of its parts. It may be expedient to state certain specific aims in education such for example as training in ethical character, leisure time activities, worthy home membership, etc., but no list, however long, could or would exhaust the possibilities of education in a single human being. If all could be stated, when they were thrown together in the individual, there would be far more than the sum of all of them present in the organism. If it could be understood that in every learning situation all of the parts that
go to make up the individual together with their interlock-
ing relationships are present and modified, then perhaps
character education would not be such an elusive and challeng-
ing phase of education. In this connection Kohler says:

"The play of all these stresses, their origins,
the strain exerted by them upon different parts
of the total field, the changes which may be the
consequence of that strain, and the cessation of
stresses and strains which follow certain of
those changes – this is the major study of
psychology, as it is the major content of our
life." 1

Morrison expressed a similar idea, though not in dynamic
terms, when he said that education can be said to have been
realized only when an individual has achieved mental
health. "The whole course of integration is the heart of
general education and equally the heart of mental hygiene." 2

This conception of education is harmonious with much
of the current educational philosophy.

"A pattern of behavior is a configured response
which can be concretely described in terms of a
given situation. A behavior item is a feature
or a component of a pattern ascertainable by
analysis. Neither pattern nor item has status
as a circumscribed entity. A pattern always
has context, and this context if analyzed can
in turn be reduced to constituent patterns.
But since contexts also have contexts, it
follows perhaps that the only pattern which has
complete integral status is the organismic
pattern which is the individual himself." 3

It has been recognized that the well integrated, unified

1. Kohler, W., Gestalt Psychology, p. 326.
3. Ibid., p. 304.
4. Gesell, Arnold, "Behavior Pattern and Behavior Mor-
development of the individual is the aim of education and that certain results always accrue from every learning situation whether they are planned or not. The Gestalt concept of the human organism as a field of energy obeying the dynamic laws of energy, the natural state of which is a state of equilibrium, places renewed emphasis upon an understanding of this field and the laws which govern its action. If certain desired reactions are to be achieved in educating the child, it is imperative that deliberate plans shall be made for this achievement. This process of planning is concerned with the selection and arrangement of subject matter, and with the method and procedures to be followed in the presentation of content. It should be stated here that many practices in present-day education are consistent with the principles of Gestalt psychology. This consistency is due, not to the use of the principles of Gestalt theory in deriving the practices, but rather to the fact that the practices have been empirically derived without any theoretical basis psychologically. In regard to this, Wheeler and Perkins say:

"The sophisticated student of Education will find little that is new in many of the conclusions regarding practical methods mentioned in this text. This is because the better methods have evolved in Education in direct defiance of prevailing psychological theory. This explains the apparent discrepancy between the newness with which psychological fact and principles are here presented and the familiarity
of the practical suggestions that follow from them." 5

Whatever progress has been made in the field of teaching, Morrison attributes to the contribution of psychology.

"It is the field of teaching, as it seems to me, in which we have made the longest steps from the almost sheer empiricism which still characterizes the study of the school system, of management and administration, and of the curriculum. That is to say, we are gathering a scientific foundation which at least throws a good deal of light on the learning process. Such advance we owe almost entirely to laboratory studies in psychology." 6

It is also well to note here, that the writer is of the opinion that group education and the formal divisions of subject matter are not inconsistent with Gestalt theory, provided that the groups are not too large to make possible the consideration of the needs of the individual pupils; and further providing that the subjects of the curriculum are properly articulated in order that they may partake of the nature of a well structured field or configuration.

The selection and arrangement of the materials which will be used as the basis for furnishing those situations which the pupils will experience is a serious problem. It is not within the province of this study to determine the content of the course of study. It should be noted, however, that studies in retention would indicate that much of the unused detail which consumes the student's time can

not be justified. Data seem to indicate that a more de­
sensible procedure would be to place increased emphasis
upon the organization of the larger aspects of the field
and to make use of various means of familiarizing the
students with the sources of details. In this connection,
Morrison says:

"It is a bit ridiculous to suppose that all the
elements of goodness, all the perceptions of
beauty, all the items of wisdom which the race
has accumulated in its evolutionary pilgrimage
can be listed, job-analysis fashion, and taught
in school. We can teach the sources, but not
the things themselves." 7

Certain principles, however, do direct the arrange­
ment and presentation of materials. The first step after
the content has been selected will be to group the selected
materials into large units or configurations in such a way
that the pupils may and will get a grasp of the significance
of the whole. After this has been done, smaller configura­
tions may be arranged for study, always, however, being
related to the larger units and deriving their significance
from their relationship to the whole. In this way, the
significant aspects of any field of study may be approached,
adding continually greater and greater detail as may be
desired, according to the level of maturity of the pupils
and likewise according to their intelligence potential.
The project method and unit arrangement of content are

harmonious with this approach, providing that they are conceived as configurations from which members or details may emerge as smaller configurations. If they are conceived as so many parts which, if put together in the right way, will make a whole, — then the unit and project will not be psychologically approached in the proper way according to Gestalt theory. Griffith gives an interesting and pointed account of the traditional method of teaching reading as contrasted with the newer psychological approach:

"The traditional method (of teaching reading) required that the pupil should learn first the letters of the alphabet, then some of the simpler words, and finally some of the simpler phrases into which words may be cast. The logic behind this order of presentation is fairly simple. Since books are made of chapters, chapters of sections, sections of paragraphs, paragraphs of sentences, sentences of words, and words of letters, it must follow that letters are the simplest elements in the act of learning how to read. Being the simplest elements, they must, therefore, be genetically prior elements. Consequently, reading ought to begin with those materials that are most simple and conform, therefore, to a genetic point of view. It takes only a casual observation of early language skills, however, to see that the first words spoken by the child are certainly not letters, and neither are they really words. On the contrary, they are phrases. The functional unit in language is either a phrase or a word-phrase. When this fact was discovered, methods of teaching reading were changed. The child now begins with those elements of language which are functionally and genetically, rather than logically, prior to the whole art of reading." 8

An interesting example of such a wrong psychological

approach to the teaching of Roman numerals in arithmetic came to the writer's attention recently. During an entire semester more or less time had been given to the teaching of the numerals. The method followed was to require the child to associate the Roman numeral with its appropriate number and a certain amount of drill was given to strengthen the associations. At the end of the semester, the child in question could give the Roman numeral for some numbers, but there was no assurance or confidence that the proper response was given. By changing the method of approach, it was possible to assist the pupil in getting a complete organization of all the numbers from one to a hundred and it required a minimum of rote memory. The Roman numerals for the numbers 1, 5, 10, 50, and 100 were all that were required to be memorized. It was an easy enough matter to explain and illustrate the principles that were employed in constructing all of the other numbers from one to one hundred and with some practice to facilitate the responses the entire process required not more than thirty minutes.

Many practices in education are theoretically correct, and yet even with these it is possible for students to have a mistaken psychological viewpoint. With regard to the teaching of handwriting, Watson says:

"This earlier development of the large muscles is taken into account in the primary grades in teaching children to write by employing large movements and then gradually progressing to the finer. Whether this is a justifiable
pedagogical procedure is questionable, since by the time they reach the writing age fine finger movements are undoubtedly possible: the child merely has to learn a double set of habits." 9

The method which Watson describes is the psychologically correct method of teaching writing, but Watson, having a misconception of the genesis of the more refined movements, misses the point entirely.

Gates, likewise, states:

"Recent research shows that reading, arithmetic, or history is mastered most effectively...by providing materials so arranged that the activities called for appeal to the pupil as eminently worthwhile and so organized mechanically that the desired learnings cannot fail to result. This new viewpoint calls for an intimate knowledge of the reaction tendencies of children and the elements in the mechanical or objective situation which determine the character of the response." 10

This is a clear statement of the traditional conception that pupils' responses depend upon elements in a situation. The Gestalt psychologist contends that the response is determined by the situation as a whole and that any element emerges from the background only in its relation to that background.

The problem of arranging the materials of instruction to meet the varying maturative levels of the student is of paramount importance in order that insight may occur, that is that learning may take place. The most effective and

economical learning is achieved when there is possible to
the student the immediate structuring of the field; that
is, when the members of the field or situation are
immediately perceived in their proper relation to one
another and to the whole. "Learning always involves some
new achievement," and this achievement should be within
the possibility of the individual's level of maturity.
The gradual grading of the levels of complexity in any
subject Wheeler calls "pacing". It is only when materials
are not properly paced that students exhibit trial and
error or random learning. According to the principle of
pacing, it is necessary to approach the ideal of suiting
each problem to the individual pupil's capacity. This is
possible, though difficult, with large groups. It pres­
supposes a careful arrangement of the subject matter into
closely paced lessons or groupings. As the pupils are
able to progress from simple configurations to more complex
ones, the tasks will be provided with materials of increas­
ing difficulty. This has been advocated in all remedial
work for some time. It is always advisable to go back to
that point where difficulties first arise to begin remedial
work. This is equivalent to saying, go back to the level
of maturity which the pupil has achieved in a field, and
begin teaching from that point. This arrangement would

take care of the pupils of varying levels of intelligence for it would be possible to determine at what level of maturity a student had approached the realization of his growth potential in a field.

Granted, therefore, that the content of the curriculum is determined and that the materials are arranged into large units or tasks, and that these larger units are organized into smaller configurations which are properly paced to meet the varying maturative levels of the students, the problem of method emerges.

Regarding method, Dewey says:

"The question of method takes on a new...form. It is no longer a question of how the teacher is to instruct and how the pupil is to study. The problem is to find what conditions must be fulfilled in order that study and learning will naturally and necessarily take place, what conditions must be present so that pupils will make the responses which cannot help having learning as their consequences. The pupil's mind is no longer to be on study or learning. It is given to doing the things that the situation calls for, while learning is the result." 12

The teacher becomes a part of the field which is to be organized or structured and her position in the field is to facilitate this organization.

"Good teaching is not done by rule. It is done by persons who enter into an intimate configuration with students. It is done by persons who have a feeling for, rather than, an extended knowledge of the whole growth pattern." 13

It is possible that, after all, the greatest contribution which a teacher may make to any learning situation is in the matter of motivation or in helping the establishment of needs and resulting tensions which can be resolved only upon the realization of the anticipated goal. Troland states that at one time Dr. Prince said to him that "the problem of motivation is the only important one in human life". In every waking moment of a child's life, there are present within him needs of one kind or another and the frenzied and fluctuating activity of the child represents his efforts to resolve the tensions produced by these needs with their varying "demand values". A teacher has before her in any school room, a number of pupils with their varying needs and tensions. Likewise, confronting each child is an objective situation in which there are numerous field members with their varying "valences" to meet these needs. If this configural field is to be effectually organized, that is to say this lesson is to be learned, the teacher must know what needs and tensions should be induced and strengthened within each child in order that the members of the field which have the highest valence for resolving those tensions may be predominant. "The organization of the total field will almost always have that bipolar character, the self being directed to something

else or away from it." The tensions existing within a pupil will determine the object in the field to which the self is directed. There are differences in potential between the subject and the object in the field and this object is the key to the organization of the perceptual field. Regarding this, Kohler states:

"If, therefore, we apply the term 'dynamical' here in a more special meaning, we may say, perhaps, that the most compulsory organization which can occur in experience is a dynamical event or attitude, consisting of one member from which it issues, and another one toward which it is directed...This type of dynamical structure occurs, not only in merely objective experience but also between the experienced self and parts of the experienced environment...Bipolar organization reminds one of those cases in physics in which either lines of force, or a process with a definite direction, develops between two parts of a field, depending upon the actual properties of those parts in their relation to each other.

"If we compare bipolar organization with a field of force or a stress existing between regions of different potential, these words may contain more than a superficial analogy. What we experience as our 'self' depends first of all upon the inner situation of our organism as a physiological system. We may also say that the particular processes underlying the experience of our 'self' are determined by the ever-changing activities of the organism. Perhaps it is not too bold an hypothesis to suggest that, according to the actual nature of those processes, in the first place, and the properties of processes underlying objective experience, in the second place, something like a field of force originates between them. Since, in terms of our general principle, the organization of experience is a picture of underlying physiological organization, we can hardly find a more fitting assumption. In some cases, however, the directed

15. Kohler, W., Gestalt Psychology, p. 323.
attitude of the self toward external experience does not seem to depend upon the inner situation of the organism, as much as it does in the case of hunger and sex. After being alone for some weeks most persons will feel an all but insuperable 'drive' toward social contact, even with strangers. It is difficult to understand, at the present time, how this directed attitude should depend upon the physiological situation of the organism as, for instance, hunger depends upon it. Nevertheless, for the most part, this attitude is quite similar to the need for food, and I do not hesitate to interpret it as a stress in the field between the self and those particular surrounding processes which are the physiological correlate of our experience of other persons." 16

If a child has a tension which directs his actions to some mischievous caprice the field will assume one type of organization. If the tension is such that the student is striving earnestly to achieve the desired structurization, then the emergent type of structuring will be quite different. This is harmonious with the expressed concept of Dewey. The teacher's duty is to so direct the activity of the pupil that learning will of necessity follow.

"It is well nigh futile even to attempt to understand the educative process and to pass from that to an intelligent apprehension of the process of teaching and the foundations of the curriculum without at least some elementary grasp of the principles set forth in both physiology and psychology". 17

If an instructor can succeed in inducing the proper attitudes and attention within her students, the learning problem, if properly paced to meet the maturative level of the students, will resolve itself. Every new achievement

16. Ibid., pp. 323-326.
17. Morrison, H. L., Basic Principles In Education, p. 56.
will be in the nature of a discovery to each child and he should be encouraged in deriving satisfaction from his accomplishment.

The assignment of a lesson, supervised study, and recitation are the effective means in the hands of a teacher for assisting the students in perceiving the relationships which exist in a field. Theoretically, it is true that lessons that are properly paced to meet the functional maturity of pupils will make it possible for them to achieve effective organization immediately by means of insight, without assistance. Actually, in the classroom situation, the important role of the teacher in providing the proper motivation to her students and the necessity for the most economical utilization of the students' and teacher's time, will, in all probability, be achieved in making the assignment. The preliminary presentation of the field will set up tensions and "if the work is interrupted before the solution, the trace of this situation contains that stress." This is the same situation that Lewin demonstrated experimentally with regard to unfinished tasks. An assignment should be in the nature of an unfinished task so that the unresolved tensions may furnish the drive for completed organization. The means of achieving an unresolved tension will vary with many factors in the teaching situation. A partly-read story

18. Kohler, W., op. cit., p. 531.
will serve to make small children complete the story. Often, with more mature students, a question or brief discussion may serve to pique the curiosity sufficiently to promote further study.

Supervised study will mean supervised effort toward organization. In cases of difficulty, the teacher may furnish a lead to a puzzled student which will clear up the difficulties and immediate insight may occur. The organization must always be achieved by the student, however, or real learning can not be said to have taken place.

Repetition or drill has been the accustomed way of fixing desired responses and the question of how much drill should be required has presented a knotty problem. It is now, and probably always will be, impossible to state how many repetitions are necessary to achieve mastery in a given field. There are many relative factors in the learning situation, such for example as the maturity level of the students, the growth potential which the students possess, and the type and length of the learning problem. These factors make it impossible to state just the number of repetitions required to achieve rapid recall. Koffka says:

"The reasons habituation requires so long a time is that the conditions of the external surroundings, or of the internal organization of the animal, exclude the possibility of immediately apprehending the configuration. Under such conditions, the act must, indeed, be repeated again and again in order to bring the configuration out. Instead of serving to strengthen bonds, the chief function of repetition is to
prepare the ground for the construction of an appropriate figure which first occurs as a result of chance. After the configuration has once been constructed, repetition serves to make the behavior appreciably firmer and easier but not before...In general, what we mean to say is that in order to be learned, the material must first receive some kind of figure, every facilitation in the construction of which, is a facilitation of learning." 19

Repetition of the stimulating situation or presentation of the field, therefore, is permissible for the purpose of assisting in the structuring of the field; and repetition of the response is permissible in order that the response may become more rapid and may occur with greater ease.

Over learning may be said to begin just as soon as responses are required after a perfect figure has emerged; in other words, as soon as repetition of a correct response is required. The degree to which a teacher wishes her students to over learn a response will determine how much drill will be required.

In connection with the problem of method, the research which has been made indicates the advantages which accrue from the use of distributed periods of presentation, of rest periods between presentations, and of the value of recitation during the learning period.

The advantages of distribution of the periods of presentation and rest periods can be best explained by the process of maturation. During the periods of rest or of

activity of another kind what has been known as "consolidation" is apparently the process of functional maturation taking place within the organism. The reason for this has so far not been discovered. Apparently, only a certain degree of maturation can be achieved during practice, but further maturation in a skill or mental activity can be accomplished during a period of rest. William James recognized the fact that improvement in performance resulted during rest periods with respect to skating and swimming. Too long periods of application to any task results in fatigue and ennui or "irradiation pattern", a term used by Snoddy meaning the loss of coordination or a spread of activity.

The recitation should be used as a teaching device and not as a means of measuring achievement. Gates' study upon the factor of recitation in memorizing is significant. Other things being equal, the more activity or recitation which a student engages in up to the point of diminishing returns, the greater ease in learning and retention. Data seem to indicate that recitation does not necessarily mean audible repetition. A student may effectually "recite" a lesson to himself. This probably has the significance

of using auditory, kinaesthetic, visual, and other possible sense media to greater advantage than would ordinarily be the case in silent study. The use of many sense modes has long been known to facilitate learning. Socialized procedure in the form of class discussions likewise enables students to recast the organization in their own words. This is a real test of understanding and indicates a grasp of the relationships existing in the field.

Method, consists, therefore, in achieving those conditions under which a figure may be constructed from a presented field most effectually. This is accomplished by means of inducing and strengthening the needs and tensions or motivations that will occasion the proper attitudes and attentions within the pupil toward the field. Distributed presentation of the field and some form of recitative activity are highly desirable for the purpose of facilitating organization and for achieving maximum organization traces or recall.

At the present time, measurement in education may consist of either the administration of intelligence tests or of achievement tests. Brief mention can only be made here of the attitude of Gestalt psychologists toward intelligence testing. With regard to Binet's work, Koffka says:

"'No more than dwarfs can be considered children of suspended development, can the feeble minded be compared mentally with certain ages of childhood.' For this reason alone, Binet's method must be rejected as totally unsuited to the in-
vestigation of the mental development of children." 22

It is doubtful if the disadvantages and hazards in the ad-
ministration and interpretation of intelligence tests are
appreciated and criticized more by Gestalt psychologists
than by students of other and differing psychological
affiliations. Regarding the use of intelligence tests,
Morrison says:

"Applied as measures of organic capacity,
their (mental tests) administrators per-
petrate a miserable piece of fundamental
injustice." 23

The conception of the growth potential and maturative levels
of accomplishment hold within them the possibility of vary-
ing levels of intelligence. Koffka says that:

"...to release a thing from one configuration,
and transfer it by reconstruction into another
configuration, would seem to be a relatively
high-grade accomplishment." 24

This is setting a relative standard of intelligence and the
judgment of Koffka seems to be harmonious with Thorndike's
conclusion that transfer is, after all, a matter of
intelligence.

It may be that the Gestalt psychologists object more
seriously to the statistical concept of the average upon
which intelligence tests are based. Lewin has made a strong
ease against this position, the substance of which is that

"...instead of a reference to an abstract average of as many historically given cases as possible, there is a reference to the full concreteness of the particular situations.... This means methodologically, that the importance of a case, and its validity as proof, cannot be evaluated by the frequency of its occurrence. Finally, it means for psychology, as it did for physics, a transition from an abstract, classificatory procedure to an essentially concrete constructive method." 25

"The concepts of the average child and of the average situation are abstractions that have no utility whatever for the investigation of dynamics". 26

Apparently then, Gestalt theory accepts the fact of differing degrees of intelligence which are manifested by individuals but they refuse to accept the present systems and means of measurement.

Achievement tests must be suited to the maturative levels of students in order to be of value as measuring instruments. With regard to this subject, Koffka says:

"The chief condition which these experiments (Kohler's) fulfill - and a condition which all good achievement tests must fulfill - is that the demands of the investigation shall be accommodated to the level of the subjects; so that he is not placed in situations entirely artificial, and of necessity unintelligible to him...Kohler's tests are of such a nature that the normal and healthy development of the subject experimented upon is in no wise disturbed.

Achievement tests are, therefore, acceptable to Gestalt theory if they do not place the subjects in situations that are too complex for their levels of maturation. It has been shown that materials of instruction must be paced properly to suit the maturative levels of pupils; and since testing materials should, by all means, parallel the material taught, it follows that the point which the Gestalt psychologists have well taken with regard to achievement tests simply lays particular stress upon the necessity of having highly valid tests. Measurement should be employed primarily as a teaching instrument and as a means of motivation. As a motivating device it is possible for a student to determine the progress he is making in reaching higher levels of maturity and for this purpose it should certainly not disturb his normal and healthy development. Every test should make possible the highest accomplishment of an individual of which he is capable. It is probable that if tests were constructed for the above purpose they would be better bases for the assignment of marks.

The emphasis which Gestalt psychology has placed upon the child and his configural development has significance in its bearing upon the training of the teacher and upon her attitude toward teaching. Every child may be said to

emerge as a figure in his relationship to the background of his environment. This means that there is a development of every so-called "side" of the child's nature, be that development positive or negative. In the process of formal education, the teacher occupies a critical position with regard to the total development of the whole child. In order to make an approach to the teaching of the child, according to Gestalt theory, the essential first knowledge of the teacher must be the basic principle of the theory that the child as a whole will always react to the situation as a whole within the classroom, as elsewhere. The significance of all classroom procedure will be greatly influenced by a knowledge of this principle. Only the genetic approach to the child-problem, will give the teacher that first knowledge which will enable her to meet the needs of a developing and maturing individual. Lewin states:

"Not the least advantage of the gifted child consists in the especially favorable environmental conditions that he usually creates for the future. I consider it one of the fundamental tasks of pedagogy so to constitute the situation of children in difficulties that the severe injuries usually occasioned by the circular causal relation may be avoided or undone. For here at least lie genuine pedagogical possibilities which do not require changing the child's 'abilities'" 28

The child and his reaction tendencies are the first consideration and school subjects serve the purpose of providing rich and varied experiences with which learning

takes place. There is no virtue within the subject matter itself; only as it provides the material from which individuals develop to higher levels of maturity and approach the realization of their growth potential can it be justified. Those subjects, therefore, will be most worth while which assist most in the realization of these aims.

Much emphasis has been laid upon the "laws of learning" and their significance to learning situations. Gestalt psychology accepts no laws of learning. Those that have been postulated are, at best, only hypotheses and are based upon association psychology. As has been pointed out previously, the laws of learning which Thorndike formulated in his earlier writings have been greatly modified by Thorndike himself. It would be best for the teacher to realize the hypothetical nature of these so-called laws and make use of those principles only which are harmonious with the general principles of the Gestalt theory of learning. These principles are flexible and are always relatively applicable to any situation.

Discipline or control becomes a different problem when the child is conceived of as a developing organism possessed of varying tensions which produce differences of potential and which achieve within the perceptual field the construction of differing figures which bring the organism back into a state of equilibrium. Control means, therefore, control of the tensions or purposes which serve
as the determiners of the activity of the child. An understanding of the varying needs and tensions which are a part of the nature of children is the first step in the exercise of classroom control. If a teacher has this understanding, it will be a much easier matter to prevent or produce the desired tensions which will bring about favorable reactions to the classroom situation which, to the child, is the presented field.

Producing those permanent changes in children which are fundamental to good behavior is that elusive and challenging type of education known as character education. It is, in reality, not a separate type of education; character training is present in every learning situation. The child reacts as a whole during every moment of its life to every field with which he is confronted. In these total reaction patterns, the affective tone is always present and in the classroom the position which the teacher occupies makes her, to a large extent, the focal point about which these emotional factors pivot. She must enter into the intimate configuration with her pupils and the character of that configuration will depend, in large measure, upon her understanding of the children and of the possibilities of control within her power. With regard to the pupil-teacher relationships, Slavson and Speer say:

"In the modern school we are necessarily concerned with the learner's attitude toward the teacher. Learning the subject was formerly the
objective and the teacher was merely a purveyor of information. Moreover, the feeling of the child toward the purveyor was not considered important, whereas now we recognize that success in learning is partly determined by the learner's attitude toward the teacher.

"Teachers formerly did not much encourage the betterment of pupil-teacher relationships, because they were, almost without exception academically minded. They were chiefly concerned with specialization in their subject matter and with what that subject matter would do to the child. In contrast, modern teachers are rapidly developing in place of this academic viewpoint a positive psychological viewpoint; they are becoming more and more concerned with the child and what he will do to the subject matter.

"Again, in former times the purposes of school activities were set up by the teacher or by the educational regime in which the child found himself, and sometimes, even with teachers and their superiors, the real purposes were vague and undefined. The objective most frequently emphasized was the achievement of grade standards that would warrant promotion. In more recent times, we have come slowly but surely to an acceptance of child-purposing as the only feasible means of stimulating real learning and individual growth." 29

There is a hopeful approach to the education of the child in the Gestalt conception of the organism as an integrated configuration. Every child will emerge as a figure which achieves some sort of organization or integration. The problem for the school is to provide for the emergence of a desirable type of individual, one who has achieved a state of mental health or a state of integrated functioning of the structure of the organism. The concept

of integration carries with it the idea of subordination and dominance, certain members functioning dominantly in their relations to others which function subordinately. The school must take the child as he comes to it at the approximate age of six years, and whereas "hitherto the schools have done nothing with the view of developing children, like young trees, from the growing impulse of their own roots", now the approach to development is known to be most successful by way of this "growing impulse" that lies within them. The common practice seems to be to speak of the developing personality of the child. What would seem to be more nearly to the point would be to speak of the maturing personality. Personality is, after all, a way of behaving, a total reaction pattern and every individual is possessed of personality, no matter how young he may be. Each organism has an individual way of behaving from the beginning and the experiences of life are but the process of maturation which takes place through the function of structure in its relation to changing environmental conditions. Every educational experience, whether it be a problem in arithmetic or the handling of monies by the treasurer for some extra-curricular activity plays its part in this maturing pattern of behavior. The significance of this

viewpoint to education is that desirable reactions must be planned for and situations must be created in which these reactions will take place. With regard to moral behavior, Vernon Jones says:

"These experiments lead us to believe that the generalizing of moral behavior is one of the most important means of assuring the greatest amount of transfer of training. Neither the facts from experiments nor any widely accepted theory of transfer of training can be interpreted as belittling the value of reasonable emphasis upon ideals and other generalized behavior in moral education....A child cannot be taught honesty without facing a variety of situations calling for honest behavior, or without associating with those who practice honesty. Not only are generalizations never built up without varied concrete experiences, they never function without them. A child must be so taught that he will be able to see fresh possibilities for the application of what he has learned to new and unforeseen situations." 31

CHAPTER VI

ASSOCIATION METHOD VERSUS GESTALT METHOD IN TEACHING

There is a basic difference in the approach to the problem of method accordingly as learning is conceived to be a pattern of behavior which is made up of parts or connections, or as it is conceived to be a total, organized pattern or configuration which progresses by a process of individuation and expansion. Wagoner is frankly a follower of the association method, and in this regard says:

"An important part in human as well as in animal learning is played by trial and error. It is by the random movements of the trunk and limbs that the body lays the foundation for the finely coordinated movements of adult life. Except for them, there would be neither tennis, nor ballet dancing, to say nothing of walking, sewing, writing, and gardening." 1

"One of the principles of learning which seems to permit of no exceptions is that knowledge to be significant must be related to knowledge already possessed and that generalized habits are developed out of specific ones." 2

Wheeler presents the Gestalt viewpoint on the same subject:

"Rhythmic and properly timed movements of all four legs (salamander) emerge together, already integrated from the expanding and differentiating total nerve pattern. Thus the walking

2. Ibid., p. 172.
movements are not a product of reflexes nor of local random movements that combine as a consequence of practice or experience. Coordinated movements result from maturation. Reflexes are end-products of differentiation, not units of integration."

"Viewed from the standpoint of the nervous system, learning is growth or maturation from undifferentiated to differentiated response. It appears in experience as an evolution of insight. Beginning in tensions relative to remote ends or low potentials, it moves toward resolution according to the law of least action."

According to Hull, this difference of opinion regarding the genesis of behavior modification is the significant difference between the two viewpoints. Regarding this, he says:

"As a matter of fact, as I read the literature, the controversy over what the postulates of a scientific theoretical psychology shall be is the chief bone of contention at the present moment. One group may insist that the postulates from which your system evolves must be parts, whereas the other group will insist that you must proceed only from wholes."

It has been an accepted principle in all learning for so long a time that "practice makes perfect", that real difficulties emerge when the position is taken that learning is a matter of achieving organization or structure or form in a perceptual field. That form does play an all-important part in learning has been experimentally proven.

According to the findings of Guilford's study, form emerges in four rather distinct stages. At first, the learner seems to be aware of some order in the presented field. Second, there is an increasing awareness of the direction in which the form is emerging. Third, the learner perceives more specifically the emerging form; and fourth, the field is perfectly structured, or a perfect form is achieved as an organized field, the relationships of which are properly established.

There seems to be no doubt about the fact that a figure does emerge in learning but often the patterned grouping comes only after a piece of learning has been committed to rote memory. In such learning where the method used was that of forming and stamping in connections, the resultant learning often consists of bits of unrelated knowledge. Later, insight into the relationships may be achieved and that which has been committed to memory takes on new significance in the light of its newly perceived relationships.

The University of Iowa Studies in Education, Volumes VIII and IX, contain three studies which bear upon the problem of connection learning and insightful learning. Wiederaenders has "attempted to set off, point by point, the agreements and disagreements between Connectionism

and Gestalt as two representative views of learning", and he has worked out, in rather general form, the application of these viewpoints in the field of elementary reading.

McConnell has attempted to subject the connection method and Gestalt method to experimental attack. His study "is designed to reveal the relative effectiveness of two procedures of learning" in the acquisition of the one-hundred addition and one-hundred subtraction facts in arithmetic. The connection method "rests its case primarily on repetition of stimulus-response connections 'authoritatively identified' with no attempt at investing them with meaning". The Gestalt method

"...stresses the dynamics of discovery of truth and meaning; in other words, it assumes that learning is the process of achieving insight, rather than of sheer repetition". 10

Henry states that the purpose of his study

"...was to test the hypothesis that the mental behavior observed in solving originals in geometry under controlled conditions can be adequately and correctly described as the operation of 'insight'". 11

The general conclusion of this study is that insight is found

"...to be present in certain instances in solving geometric originals. However, it

8. Ibid., p. 13.
9. Ibid.
10. Ibid.
11. Ibid., p. 65.
would not be correct to characterize the typical successful behavior observed as the operation of insight." 12

Brief mention was made on page 54 in this study, of the two methods as used in the teaching of Roman numerals. The Roman numerals have an initial fourth grade placement in the Knight, Studebaker and Rush, Standard Service Arithmetics, the adopted text in the State of Arizona.

**Association Method.** According to the usual method of teaching number combinations, the Roman numerals are paired with their respective Arabic numbers as:

- I or 1, II or 2, III or 3, V or 5, VII or 7

The pupils are given the number combinations from 1 to 10 in the way stated above. These are studied by the pupils just as the multiplication tables are studied to fix the connections, and drill (usually written) is given at more or less fixed intervals to provide for a facility of proper response.

The numerals from 10 to 20 are given in the following way:

- X or 10
- XI or 11
- XII or 12
- XV or 15
- XIV or 14
- XIII or 13

The same procedure is followed in fixing these combinations, study for familiarity and drill for speed of response. When

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12. Ibid., pp. 97-98.
the class average of correct responses has reached the criteria set as satisfactory learning, the combinations from 20 to 30 are given and the same procedure followed until the pupils have received the combinations from 1 to 100.

During the time when the new lessons are presented, a certain amount of drill is given as review of the preceding lessons to prevent forgetting of combinations. This procedure is interspersed with the regular work in arithmetic in multiplication and fractions during one semester, and the procedure never varied from being a matter of establishing and fixing of connections between numbers and their Roman numeral equivalents. Apparently, no patterned grouping or establishment of relationships emerged as the problem seemed to be too complex for the maturity level of fourth grade children to make possible the operation of spontaneous insight.

In the text of Knight, Studebaker, and Ruch, Standard Service Arithmetics, Grade Four, pages 98-99, the principles that govern the formation of numerals IV and IX, and VI and XI are given. Likewise, on page 100 the principles that govern the construction of numerals XIV, XIX, and XXX are presented. This text, however, carries a blocked, heavy-typed reminder on the top of page 100 which says:

REMEMBER THAT IV MEANS 4 AND IX MEANS 9

Plainly the scheme to be followed is to fix and make per-
manent in memory the Roman numerals with their Arabic equivalents, and this seems to be the system followed in general practice.

In presenting Roman numerals by this method, the requirements which Thorndike has placed upon connection forming have been met. Some attempt has been made to place the pupil in an attitude of readiness by explaining that many clocks have their numbers marked in Roman numerals, thus creating a desire within the pupil to be able to read the time on such clocks. Belongingness is established by giving the combinations in such a way that the child will know that this Arabic number "goes with" that Roman numeral. The response lies within the pupil's power of achievement and the situation is likewise within his perceptual ability. According to the law of effect, the achievement of a right response will bring satisfaction. This, in turn, will tend to bring about the correct response again and stamp it in by means of further repetition or exercise. Regarding method, Thorndike says:

"(The principle of correlation implies) that lesson and lesson be brought into relation one with another in a larger unit of some one general topic, that one topic be brought into relation with another in a still larger unit, and that one subject of study be taught with reference to the other subjects whenever the facts they present have important bearings one upon the other in the real world. The method of securing such organized related systems of connections is simply by making use of the general law of association. If the pupil is to have facts together in useful systems, the teacher must put them together. If in the
future the pupil is to think of the relations of a fact when he thinks of the fact, he must in the present connect that fact with those relations." 14

"(The principle of association is) Put together what you wish to have go together. Reward good impulses. Keep apart what you wish to have separate. Let undesirable impulses bring discomfort." 15

If this method is strictly followed, any figure or form that could arise in the learning field will be due to chance, operating, in all probability, through a rather superior or mature level of intelligence.

Gestalt Method. The method of approach to this problem of teaching Roman numerals to fourth grade children from the theoretical standpoint of Gestalt theory is quite different. In the first place, the child is given some information about the Roman numerals; for example, that they were used by the Roman people who spoke the Latin language, and that these numerals are often used at the present time for the purpose of indicating the dates of erection of buildings, for marking chapter numbers, particularly in the numbering of prefaces and chapters in the Bible, and that they are used for indicating hour numbers on clocks and watches.

The numbers and their Roman numeral equivalents are given for the following:

15. Ibid., p. 110.
I or 1, V or 5, X or 10, L or 50, C or 100

It is carefully explained to the pupil that he will be able to construct every number from 1 to 100 from combinations of these five numerals that he has learned. To achieve facility in responding to these five combinations is an easy matter.

The explanation of the relationships which must be made to exist between them to construct the other numerals follows. The numbers 2 and 3 are always made up of two Roman numerals I's as II, or three Roman numerals I's, as III. Then the principle is given that a numeral which follows a larger numeral is added to the value of the larger numeral, as VI equals 5 + 1 or 6, and XI equals 10 + 1 or 11. Any numeral which is placed before a larger numeral is subtracted from the value of the larger numeral, as IV equals 5 - 1 or 4, and IX equals 10 - 1 or 9.

Just as I equals 1, II equals 2, and III equals 3, so VI equals 5 + 1 or 6, VII equals 5 + 2 or 7, and VIII equals 5 + 3 or 8. Each one of these principles is carefully explained until the child understands them perfectly and can easily construct any numeral from 1 to 11.

It is then shown that constructing the numerals from 10 to 20 is just the same as doing those from 1 to 10 except that X is always placed before the numeral. This is demonstrated by having the pupil write the numerals from 1 to 10 with the X preceding, as XI, XII, XIV, XVI, XIX.
The next procedure is to explain the construction of numeral equivalents of 20, or XX; 30, or XXX; 40, or XL; 50, or L; 60, or LX; 70, or LXX; 80, or LXXX; 90, or XC. A pupil in the fourth grade will have no difficulty in multiplying in tens, nor will he have any difficulty in adding or subtracting in tens. As the numerals L and C have been acquired at first, no difficulty is presented in dealing with them. It is a simple matter to explain and have the pupil demonstrate that the numerals from XX to XXX consist of two tens followed by the numbers from 1 to 10, as XXI equals 21, XXIV equals 24, and XXX equals 29. Likewise, the same for numerals from XXX to XL. For numerals from 40 to 50, XL is followed by the numerals from 1 to 10, as XLI equals 41, XLII equals 42, XLIV equals 44, etc. Numerals from L to XC are constructed with L as LX equals 50 + 10 or 60, LXX equals 50 + 20 or 70, LXXX equals 50 + 30 or 80. These numerals such as LX, LXX, LXXX are followed by the numerals from 1 to 10 to form the intervening numerals, as

<table>
<thead>
<tr>
<th></th>
<th>equals</th>
</tr>
</thead>
<tbody>
<tr>
<td>LXI</td>
<td>61</td>
</tr>
<tr>
<td>LXIV</td>
<td>64</td>
</tr>
<tr>
<td>LIX</td>
<td>69</td>
</tr>
<tr>
<td>LXXI</td>
<td>72</td>
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<tr>
<td>LXXIV</td>
<td>74</td>
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<td>LXXIX</td>
<td>79</td>
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<tr>
<td>LXXXIV</td>
<td>84</td>
</tr>
<tr>
<td>LXXXVI</td>
<td>86</td>
</tr>
<tr>
<td>LXXXIX</td>
<td>89</td>
</tr>
</tbody>
</table>

The numeral for 90, or XC, is followed by numerals from 1 to 10 to form the intervening numerals between XC and C.
Such are:

\[
\begin{align*}
XCI & \text{ equals } 91 \\
XCIII & \text{ equals } 93 \\
XCV & \text{ equals } 95 \\
XCVII & \text{ equals } 97 \\
XCIX & \text{ equals } 99
\end{align*}
\]

This method of approach to the teaching of Roman numerals gives to the pupil an orderly and organized conception of the entire field. The actual memory work consists only of establishing the relations among five combinations. Certain principles with respect to the construction of numerals from 1 to 10 must be understood clearly and the numerals ending in 10, as 20 or 40, must be understood to be combinations of Roman numeral \(X\), which follows the principle of subtraction and addition when preceding or following a numeral of greater value. When the five combinations are learned and the principles are understood, it becomes only a matter of repeated response to reach the criterion set for a satisfactory degree of learning.

McConnell points out in the association method that:

"....the child must take the supposed truth of the matter on faith. Unless he circumvents the limitations of the method by surreptitious verification or discovery, he will not know why \(8 + 5\) is 13, rather than 12, 14, or any other number." 16

This point is well taken for most children with alert and inquiring minds will have sufficient spontaneous curiosity

to combine 8 with the fingers on one hand to verify the conclusion given. The almost universal practice among children of using the fingers to count upon presents an interesting phenomenon. Ogden says:

"When a child reaches the stage where a number designates not only a series of apples, or blocks, but any series of objects, homogeneous or heterogeneous, counting has become symbolical; the numbers may refer to any series and yet retain their meaning, for the symbols no longer depend upon the things themselves." 17

One of the earliest series of homogeneous objects which the child learns to count are the fingers. Yet later, these fingers lose their concrete character and become symbols of abstract numbers which are all too convenient for use in verifying the 'pedagogy of authority' about which McConnell writes.

Patterned grouping and form will arise in learning though it may not be achieved until some period of time has elapsed after the material has been committed to rote memory. If insight into the relationships existing within a field of learning will enrich and give new meaning to the material, how much more effective the learning will be if the field is presented so that the individual may achieve insight at the beginning.

Ogden is of the opinion that

"....the problem of education is not so much

to select some persons for mathematical study and excuse others, on the basis of a native disposition or talent, but to see to it that all who possess normal intelligence are so instructed that they will learn to grasp the significance of the number system and its operation."

The association psychologist must either claim that there can be no "significance of the number-system" or he must explain how such significance can arise from the establishment of many connections within the system. According to the most defensible educational theory, the significance must be provided for in method if it is to be achieved in the most effective way. Configural learning seeks to achieve optimum organization within any presented field, and this is true within the abstract field of the science of mathematics.

18. Ibid., p. 288.
CHAPTER VII

CONCLUSIONS

The conclusion that is reached in this study with regard to the implications of Gestalt psychology to education is that every child is undergoing a process of growth from the moment of birth until death. This conception of growth means maturation both of structure and function. The behavior pattern matures as a result of the action of the stimulating conditions of the environment upon the child and this behavior pattern is an integrated configuration from the beginning. It is achieved, not by a process of synthesis of developing elements or members, but by a process of reaction of the total organism to the total environmental situation at all times. From the total reaction pattern may emerge smaller reaction patterns by a process of individuation but they function always in subordination and in relation to the total pattern.

The school must provide opportunity for the child to express his present level of maturity in situations not too complex to prevent insight into the relations of his perceptual field. And furthermore, by a proper pacing of the difficulty of these learning situations, the child will be allowed to reach higher and higher levels of maturity as he approaches the realization of his growth potential.
Character education or the attainment of desirable emotional motives is the ultimate goal of education since these emotional factors play such a dominant part in the behavior of individuals. These affective states are present in every learning situation for they are the tensions which seek to achieve resolution in order that the organism may attain its natural state of equilibrium or emotional balance. A favorable emotional attitude means interest and "there can be no doubt that the pleasure taken in an achievement operates as an incentive to new achievements."

The position that the teacher occupies is such that she becomes a part of the learning configuration and the way in which the student organizes the field depends in no small measure upon the teacher and her realization of her relation to the child. Every child will be educated, that is, he will achieve some degree of maturity with his educative experience. How favorable this achievement may be depends upon what he is taught, how it is planned and arranged to meet his maturative needs, and the means that are employed to help him make the most effective organization of all the perceptual fields with which he is faced.

The general principles of Gestalt psychology have been followed in their application to certain problems or phases of educational procedure in this study. There are other

well-known approaches, at the present time, to these problems. The Bond Theory is the most generally known and accepted and E. L. Thorndike has been most closely identified with this theory. The Conditioned Response Theory of learning which was advocated by John B. Watson is strongly supported by some students of the problem, especially by Walter S. Hunter. Fundamentally, these theories are different for they are based upon differing concepts of the functional development of behavior patterns. There are, however, certain similarities in the principles enunciated by the writers supporting them which indicates that the phenomenon of learning manifests itself in the same way. The interpretations of these factors have varied according to the basic viewpoints and philosophy of their advocates.

At the present time the research in the fields of neurology and physiology are lending increasing evidence and weight to the contentions of the Gestalt School. The end is not yet, nor is it even in sight. Knowledge of how the organism functions must probably depend upon a knowledge of what happens structurally when it functions. The situation resolves itself into a choice of viewpoints for the student of the psychology of learning. Whitehead says that:

"In formal logic, a contradiction is the signal of a defeat: but in the evolution of real knowledge it marks the first step in progress towards
a victory. This is one great reason for the utmost toleration of variety of opinion."

There is no lack of variety of opinion, but it is imperative that research may be sufficiently extensive to warrant definite conclusions upon which a sound psychology of learning may be based.

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