

THE PSYCHOLOGY OF HUMAN LEARNING

AN INTRODUCTION

BY

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INTRODUCTION

During the past thirty years there has been an amazing development in the field of human and animal learning. The literature is now so extensive that its mastery by any one person is an almost insuperable task. There have been accumulated a wealth of empirical data and generalization, of special and general theory, and a variety of points of view and of interpretative systems. Naturally, theories and interpretations exhibit much disagreement. Many generalizations may be regarded as valid for the present, others must be regarded as tentative and questionable because of the lack of reliable or adequate data, while with some topics no generalizations are permissible because the empirical data are in direct conflict.

Throughout his professional life this field has been the author's prime research and teaching interest, and he soon came to feel the need for a comprehensive reference manual which would attempt to organize this diverse material in a systematic fashion, present the pros and cons for the various theories and points of view, make such generalizations as are justified for the present, note the unreliable, inadequate, and apparently conflicting data, and point out the type of research needed to resolve these conflicts and make possible valid generalizations. It was assumed that such a comprehensive manual would prove to be of service to advanced students and investigators, and would exercise a stimulating and directive influence upon the course of subsequent investigation.

Some years ago the author proposed to write a two-volume manual with the advice and critical help of the writer. The author's first task was to read and digest every worth-while article of this extensive literature, in the course of which he accumulated a mass of typewritten digests and analyses. He then undertook to write the first draft of the manuscript without much regard to limitations of space. As these chapters were completed, they were turned over to the writer, who added to each chapter an extensive series of critical and con-

structive comments and interpretative analyses, and it was in the light of these that the author proposed to condense and revise this first draft into the final manuscript.

In the autumn of 1936 this first draft was about four-fifths completed. Because of the demands of health, a change of location, and the assumption of new teaching and administrative duties, the completion of the work was postponed for several years. When he was ready to return to this work in 1940, he was persuaded to write first the present textbook for students. He consented to do this partly because he felt that there was a need for such a text, but primarily because he felt that the necessary condensation and revision involved would prove invaluable in writing the final draft of the larger work in which he was primarily interested.

Not having seen the manuscript, the writer cannot pass judgment upon its merit as a text nor can he comment upon its distinctive features. However, a text of this sort must necessarily be selective with respect to the topics treated and their relative emphasis. It must also be written in a more positive and dogmatic tone — much more expressive of the author's views and evaluations than would have been the case with the projected manual.

The author was thoroughly qualified to write such a text. It was written in the prime of life with a background of considerable research and teaching in this, his favorite field. He had an extremely able and vigorous mind. He was independent in judgment, intellectually honest, and thoroughly imbued with the ideals of scientific scholarship. He was a prodigious worker and had a first-hand knowledge of every worth-while article in the literature. He had contributed chapters on Learning to some of our published texts and, finally, he had the experience in writing the first draft for the projected manual. Whatever merits this text may finally be judged to possess, there is no doubt that it will be regarded as a thoroughly sound and scholarly piece of work.

The manuscript was completed and sent to the publisher shortly before his untimely death. Unfortunately, no preface had been written, and this brief introduction must serve in its

stead. If such a preface had been written, the author would undoubtedly have expressed his thanks and appreciation to many who gave him aid and encouragement: among them, to A. W. Melton, H. N. Peters, and K. W. Spence for their critical reading of the manuscript; to the stimulating group of graduate students with whom he discussed the chapters; to J. B. Stroud, who compiled the subject index and settled puzzling points in the proofreading; and to Mildred Atwood, his secretary, for her untiring labors at typing the manuscript, reading proof, and otherwise preparing the book for publication.

His thanks are due the many authors who have so willingly permitted him to use materials from their works.

HARVEY A. CARR

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CHAPTER I

CONCEPTS AND METHODS

THE CONCEPT OF LEARNING

Systematic experimental study of human learning dates from 1885, when Ebbinghaus stated some of its fundamental problems, devised methods for studying them, and in many ways set the pattern for later research. His monograph, *Memory: a contribution to experimental psychology* (1885, 1913), is a landmark in the history of psychology and is still a model which will repay careful study. Since that time, research in learning has appeared at an accelerated rate, and with advancing knowledge it has become increasingly clear that the concept of learning lies at the heart of psychology.

The Generality of Learning

Learning, which begins at birth or before and continues until the disintegration of the organism, is a major developmental dimension of mind. A knowledge of its characteristics and of the conditions which determine it and its rate is fundamental to an understanding of psychological development and organization. The significance of the concept is widened by the fact that its relevance is not limited to organization and development as general problems of psychology, but extends into many special and applied fields.

The pervasiveness of learning can be grasped more clearly if one considers the part it plays in some of the categories of psychology. Psychologists have long recognized that modes of perceiving are functions of past experience, which is another way of saying that they are products of learning. Experimental evidence, accumulating through the last 50 years, has given this observation rich objective support. From simple perceiving of objects, through perceiving of spatial relations, to perceiving the most complex phenomena of whatever kind, learning is a dominant feature. The symbolic functions

called ideas are learned, as has been recognized ever since the doctrine of innate ideas was discarded. The solutions of problems by means of ideas, called reasoning, exhibit the pattern of learning and are determined by similar conditions.

The specificity of likes and dislikes, of the whole range of affective and emotional responses to stimulation, is mainly learned. Observations upon the development of personality traits have revealed that a great many — probably a majority — are specifically what they are as a result of training. Certainly their organization is learned. Even the motivating conditions which select and direct behavior are highly susceptible to learning and, as development proceeds, become increasingly learned. Relatively early in life the native motive-incentive conditions become so overlaid by acquisition that the native conditions are present only by inference and history. The individual's sets, interests, attitudes, wants are, thus, a product of his personal history and, in turn, are determiners of his present and future behavior.

It will help one's grasp of the reach and ubiquity of learning to imagine the removal from his response-repertoire of everything that he has learned. When the results of learning go, little is left save the vegetative processes of the organism and a relatively few simple overt responses. Ability to recognize now familiar objects, to perceive the external world as one now perceives it, to read, to converse, to think of the things one now thinks about, to be moved to action toward and by the things which now move one, to respond in now accustomed ways to other people — these and many others have departed. Nearly everything, in fact, which makes man the complex psychological organization that he is has gone.¹

These statements about the pervasiveness of learning do not

¹ The generality of the concept of learning has been treated more in detail elsewhere (McGeoch, 1936). Carr's textbook (1925) is a concrete demonstration, though without explicit assertion to that effect, of the way in which learning pervades general psychology. Hollingworth's (1928) organization of the field in terms of the concept of redintegration is a demonstration of the same point in a different way. The pervasiveness of the concept is shown implicitly in many other recent books and journal papers.

imply that nothing is inherited. The inherited structure of the organism is a basic condition of all learning; it sets the bounds and framework within which practice has its influence. The simple native responses and primitive motivating conditions are, likewise, the starting points of learning, and the maturation of structure and function through the early years of life serves to complete the contribution of heredity to the conditions of learning. Heredity contributes the receptors, through which behavior is initiated, the nervous system, muscles and glands by which it exists, and within this native framework of structure and events learning occurs. To the psychologist a knowledge of physical structure and of maturation in all of their aspects is important, but the greater susceptibility of learning to direct environmental and experimental control renders it the more fruitful of the two, both for scientific research and for practical application.

The Problem of Definition

In a majority of cases there is agreement, without recourse to formal definition, upon whether or not a given change in behavior is an instance of learning. The formulation of a systematic definition is not easy, and the frequent attempts which have been made have not led to concordant results. There are, for one thing, a number of puzzling borderline cases which superficially look like learning, but which are not considered to be, such as maturation, work decrements, sensory adaptation, and drug effects. There is, likewise, the difficulty of framing a definition which will not be too heavily weighted with the framer's theoretical views to be acceptable to all. The important thing for the present purpose is that there is practically no doubt among the competent that the phenomena treated in this book are phenomena of learning.

To discuss critically the suggested definitions of learning here would be fruitless. Instead, a general statement will be made which will include the phenomena discussed in this book. *Learning, as we measure it, is a change in performance as a function of practice. In most cases, if not in all, this change has a direction which satisfies the current moti-*

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vating conditions of the individual. Practice may also change experience, but most of the changes measured and discussed are changes in behavior. What learning means, in more detail and aside from any formal definition, can best be seen from a presentation of the phenomena and of the conditions which determine them.

Learning and Retention

It has long been customary to divide the field into two main parts, 'learning' or fixation, and 'retention.' At the level of logical analysis this division is clear, because an act must first be fixated before it can be retained. In the learning of complex acts by continued practice, however, our measurements do not often separate fixation from retention, and the two are intermingled in each practice trial after the first. For the sake of convenience, the distinction between learning and retention has been given a different meaning than the logically analytic one, *learning* being used to designate the acquisition of changes in behavior during a specified time or up to a certain level, and *retention* being used to mean any measured persistence of these changes after practice ceases. Any measured failure of such persistence is called *forgetting*.

The way in which retention pervades learning, as these words are commonly used by psychologists, can be seen in any learning activity requiring more than a single trial, such as the learning of a series of words. The changes in behavior (verbal responses) acquired during the first trial are retained, at least in part, until the second trial. There new ones are added to those retained; some or all of the results of the first and second trial are retained until the third trial, when more are added, and so on until practice stops. If the results of practice were not carried over from trial to trial, if they did not accumulate progressively, many trials would yield no more learning than would one trial alone.

Not all of the acquisitions at each successive trial are carried over to the next; some are forgotten and must be refixated. A curve of learning represents a progressively greater balance in favor of retention, so that it is, in part, a retention curve.

In addition to the initial modifications of behavior (*fixation*), which do not involve retention in the sense meant here, the retained modifications are further changed as they are repeated on later trials. Fixation and retention thus mutually interact in the course of what we call learning.

It may also be stated briefly here, to be elaborated much later, that learning pervades retention in the sense that one of the conditions of forgetting, or failure of retention, is the learning of other responses, *i.e.* one forgets by learning other things.

Usage has fixed certain names upon clusters of conditions. The names cannot mislead if one understands clearly what they mean. When studying the acquisition of behavior changes up to some arbitrary level of performance, such as two perfect trials in succession, it is customary to speak of 'learning' and to disregard in the naming the fact that retention has pervaded the process. Similarly, when performance is measured after an interval of no practice, it is customary to call the results measures of 'retention,' disregarding the fact that there would have been no learning to be retained had there been no cumulative retention of behavior changes during practice, and disregarding the fact that further learning has been one condition of loss, if any, in retention.

CHARACTERISTIC MATERIALS AND METHODS

Certain procedures are found in most experiments on learning, regardless of the material and of the specific methodology. The subject is given initial *instructions* which tell him what kind of material he is to learn and whatever else the experimental problem requires and permits that he know. The wording and presentation of the instructions are a basic experimental condition. At the beginning of most experiments the subject is given one or more periods of *practice* at learning the kind of material he is to learn in the main experiment. Unpracticed subjects need at least a brief experience with the conditions of the experiment, and in some cases an extensive one, before satisfactory records can be obtained.

Practice is the generic term for any repetition of a material,