

PSYCHOLOGY FOR STUDENTS OF EDUCATION

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PREFACE

This book has been written to meet the needs of students of education who are seeking from psychology the facts and principles that have a bearing upon their problems. It is designed to serve both as a text for college and normal school courses and as a book for general reading by the student already engaged in professional service.

In selecting materials, I have been guided by the aim of presenting clearly and accurately the important principles of psychology with illustrations and applications that are of distinct significance in education. The outcome of this effort has been a departure in several respects from the usual introductory textbook of psychology. Perhaps the most conspicuous deviation is the omission or reduction of space devoted to some of the experimental and descriptive studies of the sensory processes and perception. The facts of color combinations, the theories of vision and audition, illusions, and the perception of time and movement are samples of topics that have been omitted entirely or relegated to a subordinate position. A brief account of the introspective analysis of the content of consciousness has been included, however, partly to give the student some familiarity with this field of research and partly to introduce portions of the technical vocabulary essential to the understanding of later sections and much of the suggested collateral reading. The various mental processes, such as perception, memory, and conception, are treated mainly as varieties of re-

actions and types of learning rather than as mental structures.

A relatively large amount of space and emphasis is given to the mechanics and dynamics of human nature for which much of the first part of the book is preparatory. The treatment of the receiving, connecting and reacting mechanisms, however, is schematic and brief. Attention is centered on the functions rather than the structures of these organs, and little is presented that does not bear upon the genuinely psychological problems that follow.

The investigations of learning in the case of the "higher" mental processes of analysis, abstraction or conception and reasoning are few, but the need of guidance in educational practice is here most keenly felt. My attempt to meet this need on the basis of available facts may have resulted in an impression of dogmatism. I have, however, preferred to state what seem to be the best solutions of the problems rather than to confuse the student with divergent views or to neglect important issues.

While the book has been written to satisfy the needs of students of education primarily, it may be found serviceable as an introductory text in general psychology, especially by those who wish to give a relatively large amount of time to the dynamics of human behavior and the more complex mental activities.

My obligations for assistance in the preparation of the book are heavy. To Professor E. L. Thorndike, I am indebted, not only for many suggestions for the revision of a first draft of the manuscript which he read, but for the wider influence of his teachings and writings that will be obvious throughout the book. I am grateful to Miss Eloise Boeker, Miss Donah Lithauer and Miss Dorothy

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PSYCHOLOGY FOR STUDENTS OF EDUCATION

CHAPTER I

THE METHODS AND SUBJECT MATTER OF PSYCHOLOGY

By the use of methods similar to those employed in the natural sciences, psychology attempts to solve many of the problems concerning human behavior which have long been treated in less exact fashion. Teachers, physicians, lawyers, preachers, business executives, in fact, people in all walks of life attempt to understand, as best they may, by observing their own impulses, feelings, thoughts, and acts, as well as the behavior of others, the general characteristics of human conduct, and the peculiar traits of particular individuals. As a result of our observations, most of us have acquired notions concerning the motives which may be relied upon to stir us or others to action; concerning the acts and situations which please and displease; concerning the signs by which emotions and thoughts are made manifest. We have acquired methods of estimating traits of character such as honesty, sociability, ambitiousness, and traits of mind, such as alertness, depth, and sagacity. We have convictions concerning the relative mentality of men and women; concerning the temperaments of negroes and whites; concerning the learning capacity of children and adults. We have beliefs about the influence of the weather, fa-

tigue, or coffee upon efficiency in thought or skill. Long the subject of ordinary speculation, these problems and many similar ones when attacked by scientific methods constitute psychology.

THE GENERAL METHODS OF SCIENTIFIC INVESTIGATION

The Unreliability of Ordinary Observation.—Ordinary observation of human behavior is extremely untrustworthy and as a consequence personal opinions are likely to be incorrect. Several investigations, under conditions similar to those of actual life, have disclosed a fallibility of observation and report which seems almost incredible. For example, an act involving a quarrel was once carefully rehearsed, the stage photographed, the conversation memorized, and the brief scene then performed before a group of professional men. Thinking the quarrel real, and anticipating the use of their testimony in court, the witnesses wrote out a full report. Among the forty men, only one had observed and remembered as much as 80 per cent of the important facts, twenty-six had omitted from 20 to 50 per cent, and thirteen more than half. Besides these omissions, from 5 to 50 per cent of the statements were erroneous; some of them pure inventions.

That the surprise and emotional upset are not mainly responsible for such results has been frequently demonstrated by experiments upon witnesses who were aware of the artificiality of the scene. A section of a motion picture requiring about three minutes' time was shown to a group of college students who were familiar with the character of errors in such experiments. Following the display, a list of 60 questions concerning more or less obvious details were asked. From 10 to 40 per cent

were unanswered, and of the replies from 8 to 50 per cent were wrong. When the task is made even more simple by giving the subject an ordinary colored picture for a half minute of study, the reports still show glaring omissions and errors.

Methods of Increasing the Reliability of Observation. The unreliability of observation noted in such experiments is due partly to the subject's inexperience in the particular field, partly to the complexity of the events, and partly to their brevity. The scientific worker attempts to improve the conditions of observation in these three directions. First, he must secure training in perceiving the particular items of interest. Just as the physician must learn to detect with greater accuracy the physical signs of disease, the psychiatrist those of insanity, the teacher those of inattentiveness, as the result of continued practice, so in psychology the investigator must learn to observe his own mental states, the fleeting images of memory or imagination, the feeling content of anger, excitement or fear, or the qualities of organic sensations, as well as the eye-movements, facial expressions, vocalizations or other results of activity in other people. Although nearly every one has observed the eyes of others during the act of reading, few people have noticed with any precision the jerky, start and stop character of the movement of the eye as it follows the printed line. Even when attention is called to the eye-movements, they are not readily perceived at first, although after a period of practice they may be observed with considerable precision. Practice will greatly improve the accuracy and precision of observation along any line, hence the scientific method demands trained observers.

Observation becomes more effective when the facts to be considered are isolated and controlled. Isolation may

be secured partly as the result of training, inasmuch as one may learn to attend to certain facts while neglecting others. One reason for the incompleteness of observation and report in such experiments as those mentioned above, lay in the fact that attention was under no definite control, was guided by no particular question. The subjects observed in general. Attention must be specifically controlled and directed to the pertinent matters lest the observer be led astray by irrelevant details or place emphasis on the wrong facts.

The Conditions of an Experiment.—The facts of observation must be isolated in another sense, in the mechanical sense that the observer must control all of the conditions which may conceivably affect the factor under study. The character of the eye movements, for example, may vary according to the length of the line, the difficulty of the material, the size of the type, or the brightness of the illumination. Usually the subject, therefore, is seated in a room from which unusual light, sounds, and other distractions are excluded. The material to be read, the distance of the eyes from the copy, and all other factors which might affect the performance are controlled and reproduced when the experiment is repeated.

When the investigator is attempting to discover the causes and effects of an observed fact, it is especially important to isolate the fact and control all other factors. Thus, to ascertain the effect of the difficulty of reading material upon the character of the eye movements, it would be necessary to hold constant all of the factors—length of the line, size of type, illumination, fatigue, etc.—while the difficulty of the material alone varied in repeated tests. In studying the effects of ventilation on mental efficiency, subjects were kept in a room in which

temperature, movement of the air, humidity, the percentage of oxygen, and the percentage of expired matter could be mechanically and independently varied. Under these conditions, the specific effects of temperature could be determined by securing samples of work under different degrees of heat, while other factors were held constant. Similarly the influence of humidity or of other factors could be ascertained by varying each while all others are controlled.

Human subjects are played upon by so many forces and their adjustments to them are so subtle, that extraordinary care must be exercised to secure adequate control of the conditions. A business-college teacher had developed a system of teaching handwriting. It was urged that this system was better than any other because most of the pupils became unusually good writers. But the truth was that the unusual amount of time and relentless insistence on achievement rather than the merits of the system were responsible for the pupils' success. Causes can be determined only when all of the influences are taken into account. The writing system must be tried by many different teachers on many different classes and the results compared with those obtained from trials of other systems, when the length of practice, the skill of teachers, the initial ability and interest of the pupils, and other factors are equalized. Comparison of the school grades of students who smoke with the marks of non-smokers is usually of no scientific value for the same reason: we cannot tell whether the difference is due to smoking or to some one or more of many other factors such as differences between the groups in home surroundings, general intelligence, or to drinking or other habits.

In addition to isolating the facts to be observed and

controlling all other significant influences, the scientific method demands that an observation must be repeated before it is finally accepted. The possibility of repetition must be insured by a careful description of the experimental conditions. This is an important scientific safeguard. It is not sufficient that the same observer repeat an experiment, although this is desirable. He must state his procedure in full so that another investigator, perhaps one who is skeptical, may set up an identical outfit and repeat the experiment. In this way, errors in observation, recording, and computation, and mistakes due to failure to observe all of the influences at work or to other defects, are frequently discovered.

Isolation of the facts to be observed, control of other factors which may influence the results, and the provision for repetition of the whole procedure constitute the *experimental* method. An *experiment* thus differs from ordinary observation in that it is more carefully carried out, it is more rigid, cautious, and systematic.

The Use of Mechanical Aids to Supplement Observation.—Even with all of the precautions which characterize the experiment, the results may be incomplete and often erroneous since, even when well trained, observation is not infallible. Greater precision may often be obtained by the use of mechanical devices. The astronomer utilizing the telescope, and the botanist the microscope, are able to make more accurate and detailed observation than could be accomplished by the unaided eye. Especially useful for scientific purposes are the instruments which yield a permanent record of the facts which may be studied at any time by any person. Thus, both astronomers and botanists utilize extensively the photographic camera. Similarly, in psychology, instead of depending upon the report of an investigator who studies

the movements of the eyes by ordinary observation, we prefer the photographic records that may be secured by use of an ingenious invention. Instead of estimating the changes in distribution of the blood, the force of the heart beat or respiration during an emotion, it is better to secure graphic records by the use of a variety of delicate recording devices. Instead of describing the facial expressions verbally, it is better to photograph them. Advances in psychology, as in other sciences, have been occasioned, in part, by the development of instruments which have not only made observation more trustworthy but more detailed and refined.

The Need of Measurements.—Of prime value are those instruments which make provision for a quantitative statement—a measurement. One can estimate roughly the heights of men, but for scientific purposes they must be measured with standard instruments under standardized conditions. One can estimate roughly the relative speed of muscular reactions, but with a delicate timing device they may be measured in thousandths of a second. The brightest pages in the history of psychology are those relating to the development of measurements, and many inventions of measuring devices have made possible great progress in knowledge. The technique for measuring the frequency and duration of eye movements has been utilized in the study of a wide variety of problems in reading. The measurement of general mental ability mainly the work of the last decade has already led to researches that can scarcely be summarized in a single volume. The invention of measuring scales for educational achievement was the forerunner of much of the scientific work in that field. Human traits are most of them unusually difficult to measure because of their complexity and because of the variations in performance from