

THE CONTRIBUTION OF PSYCHOLOGY TO EDUCATION

Edward L. Thorndike (1910)

Classics in the History of Psychology

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Psychology is the science of the intellects, characters and behavior of animals including man. Human education is concerned with certain changes in the intellects, characters and behavior of men, its problems being roughly included under these four topics: Aims, materials, means and methods.

Psychology contributes to a better understanding of the aims of education by defining them, making them clearer; by limiting them, showing us what can be done and what can not; and by suggesting new features that should be made parts of them.

Psychology makes ideas of educational aims clearer. When one says that the aim of education is culture, or discipline, or efficiency, or happiness, or utility, or knowledge, or skill, or the perfection of all one's powers, or development, one's statements and probably one's thoughts, need definition. Different people, even amongst the clearest-headed of them, do not agree concerning just what culture is, or just what is useful. Psychology helps here by requiring us to put our notions of the aims of education into terms of the exact changes that education is to make, and by describing for us the changes which do actually occur in human beings.

Psychology helps to measure the probability that an aim is attainable. For example, certain writers about education state or imply that the knowledge and skill and habits of behavior which are taught to the children of today are of service not only to this generation and to later generations through the work this generation does, but also to later generations forever through the inheritance of increased capacity for knowledge and skill and morals. But if the mental and moral changes made in one generation are not transmitted by heredity to the next generation, the improvement of the race by direct transfer of acquisitions is a foolish, because futile aim.

[p. 6] Psychology enlarges and refines the aim of education. Certain features of human nature may be and have been thought to be unimportant or even quite valueless because of ignorance of psychology. Thus for hundreds of years in the history of certain races even the most gifted thinkers of the race have considered it beneath the dignity of education to make physical health an important aim. Bodily welfare was even thought of as a barrier to spiritual growth, an

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undesirable interferer with its proper master. Education aimed to teach it its proper place, to treat it as a stupid and brutish slave. It is partly because psychology has shown the world that the mind is the servant and co-worker as well as the master of the body, that the welfare of our minds and morals is intimately bound up with the welfare of our bodies, particularly of our central nervous systems, that today we can all see the eminence of bodily health as an aim of education.

To an understanding of the material of education, psychology is the chief contributor.

Psychology shares with anatomy, physiology, sociology, anthropology, history and the other sciences that concern changes in man's bodily or mental nature the work of providing thinkers and workers in the field of education with knowledge of the material with which they work. Just as the science and art of agriculture depend upon chemistry and botany, so the art of education depends upon physiology and psychology.

A complete science of psychology would tell every fact about every one's intellect and character and behavior, would tell the cause of every change in human nature, would tell the result which every educational force --every act of every person that changed any other or the agent himself --would have. It would aid us to use human beings for the world's welfare with the same surety of the result that we now have when we use falling bodies or chemical elements. In proportion as we get such a science we shall become masters of our own souls as we now are masters of heat and light. Progress toward such a science is being made.

Psychology contributes to understanding of the means of education, first, because the intellects and characters of any one's parents, teachers and friends are very important means of educating him, and, second, [p. 7]because the influence of any other means, such as books, maps or apparatus, cannot be usefully studied apart from the human nature which they are to act upon.

Psychology contributes to knowledge of methods of teaching in three ways. First, methods may be deduced outright from the laws of human nature. For instance, we may infer from psychology that the difficulty pupils have in learning to divide by a fraction is due in large measure to the habit established by all the thousands of previous divisions which they have done or seen, the habit, that is, of "division -- decrease" or "number divided -- result smaller than the number." We may then devise or select such a method as will reduce this interference from the old habits to a minimum without weakening the old habits in their proper functioning.

Second, methods may be chosen from actual working experience, regardless of psychology, as a starting point. Thus it is believed that in the elementary school a class of fifteen pupils for one teacher gives better results than either a class of three or a class of thirty. Thus, also, it is believed that family life is better than institutional life in its effects upon character and enterprise. Thus, also, it is believed that in learning a foreign language the reading of simple discussions of simple topics is better than the translation of difficult literary masterpieces that treat subtle and complex topics. Even in such cases psychology may help by explaining *why* one method does succeed better and so leading the way to new insights regarding other questions not yet settled by experience.

Third, in all cases psychology, by its methods of measuring knowledge and skill, may suggest means to test and verify or refute the claims of any method. For instance, there has been a failure on the part of teachers to decide from their classroom experience whether it is better to teach the spelling of a pair of homonyms together or apart in time. But all that is required to decide the question for any given pair is for enough teachers to use both methods with enough different classes, keeping everything else except the method constant, and to measure the errors in spelling the words thereafter in the two cases. Psychology, which teaches us how to measure changes in human nature, teaches us how to decide just what the results of any method of teaching are.

[p. 8] So far I have outlined the contribution of psychology to education from the point of view of

the latter's problems. I shall now outline very briefly the work being done by psychologists which is of special significance to the theory and practice of education and which may be expected to result in the largest and most frequent contributions.

It will, of course, be understood that directly or indirectly, soon or late, every advance in the sciences of human nature will contribute to our success in controlling human nature and changing it to the advantage of the common weal. If certain lines of work by psychologists are selected for mention here, it is only because they are the more obvious, more direct and, so far as can now be seen, greater aids to correct thinking about education.

The first line of work concerns the discovery and improvement of means of measurement of intellectual functions. (The study of means of measuring moral functions such as prudence, readiness to sacrifice an immediate for a later good, sympathy, and the like, has only barely begun.) Beginning with easy cases such as the discrimination of sensory differences, psychology has progressed to measuring memory and accuracy of movement, fatigue, improvement with practice, power of observing small details, the quantity, rapidity and usefulness of associations, and even to measuring so complex a function as general intelligence and so subtle a one as suggestibility.

The task of students of physical science in discovering the thermometer, galvanometer and spectroscope, and in defining the volt, calorie erg, and ampère, is being attempted by psychologists in the sphere of human nature and behavior. How important such work is to education should be obvious. At least three-fourths of the problems of educational practice are problems whose solution depends upon the *amount* of some change in boys and girls. Of two methods, which gives the *greater* skill? Is the gain in general ability from a "disciplinary" study so great as to outweigh the loss in specially useful habits? Just how much more does a boy learn when thirty dollars a year is spent for his teaching than when only twenty dollars is spent? Units in which to measure the changes wrought by education are essential to an adequate science of education. And, though the students of education may establish these units by their own investigations, they can use and will need all the experience of psychologists in the search for similar units.

[p. 9] The second line of work concerns race, sex, age and individual differences in all the many elements of intellect and character and behavior.

How do the Igorottes, Ainus, Japanese and Esquimaux differ in their efficiency in learning to operate certain mechanical contrivances? Is the male sex more variable than the female in mental functions? What happens to keenness of sensory discrimination with age? How do individuals of the same race, sex and age differ in efficiency in perceiving small visual details or in accuracy in equaling a given length, or in the rapidity of movement? These are samples of many questions which psychologists have tried to answer by appropriate measurements. Such knowledge of the differences which exist amongst men for whatever reason is of service to the thinker about the particular differences which education aims to produce between a man and his former self.

These studies of individual differences or variability are being supplemented by studies of correlations. How far does superior vividness and fidelity in imagery from one sense go with inferiority in other sorts of imagery? To what extent is motor ability a symptom of intellectual ability? Does the quick learner soon forget? What are the mental types that result from the individual variations in mental functions and their inter-correlations? Psychology has already determined with more or less surety the answers to a number of such questions instructive in their bearing upon both scientific insight into human nature and practical arrangements for controlling it.

The extent to which the intellectual and moral differences found in human beings are consequences of their original nature and determined by the ancestry from which they spring, is a matter of fundamental importance for education. So also is the manner in which ancestral influence operates. Whether such qualities as leadership, the artistic temperament, originality,

persistence, mathematical ability, or motor skill are represented in the germs each by one or a few unit characters so that they "Mendelize" in inheritance, or whether they are represented each by the coöperation of so many unit characters that the laws of their inheritance are those of "blending" is a question whose answer will decide in great measure the means to be employed for racial improvement. Obviously both the amount and [p. 10] the mode of operation of ancestral influence upon intellect and character are questions which psychology should and does investigate.

The results and methods of action of the many forces which operate in childhood and throughout life to change a man's original nature are subjects for study equally appropriate to the work of a psychologist, a sociologist or a student of education, but the last two will naturally avail themselves of all that the first achieves. Although as yet the studies of such problems are crude, speculative and often misguided, we may hope that the influence of climate, food, city life, the specialization of industry, the various forms of the family and of the state, the different "studies" of the schools, and the like will come to be studied by as careful psychologists and with as much care as is now the case with color-vision or the perception of distance.

The foundation upon which education builds is the equipment of instincts and capacity given by nature apart from training. Just as knowledge of the peculiar inheritance characteristic of any individual is necessary to efficient treatment of him, so knowledge of the unlearned tendencies of man as a species is necessary to efficient planning for education in general. Partly in conscious response to this demand and partly as a result of growing interest in comparative and genetic psychology, there have been in the last two decades many studies by psychologists of both the general laws of instinct and their particular natures, dates of appearance and disappearance, and conditions of modifiability. The instincts of attitude-- of interest and aversion -- are of course to be included here, as well as the tendencies to more obviously effective responses.

It is unfortunately true that the unlearned tendencies to respond of ants and chickens have been studied with more care than those of men, and also that the extreme complexity and intimate mixture with habits in the case of human instincts prevent studies of them, even when made with great care, from giving entirely unambiguous and elegant results. But the educational theorist or practitioner who should conclude that his casual observations of children in homes and schools needs no reinforcement from the researches of psychologists would be making the same sort of, thought [sic] not so great, an error as the pathologist or physician who should neglect the scientific studies of bacteria and protozoa. Also the psychologist who condemns these [p. 11] studies *in toto* because they lack the precision and surety of his own studies of sensations and perceptual judgments is equally narrow, though from a better motive.

The modifications of instincts and capacities into habits and powers and the development of the latter are the subjects of researches in dynamic psychology which are replacing the vague verbal and trite maxims of what used to be called "applied psychology" by definite insights into reality far in advance of those which common-sense sagacity alone can make. We are finding out when and why "practice makes perfect" and when and why it does not; wherein the reinforcement of a connection between situation and response by resulting satisfaction is better than the inhibition of alternative connections by discomfort and wherein it is not; what the law of diminishing returns from equal amounts of practice is, what it implies, and how it is itself limited; how far the feelings of achievement, of failure and of fatigue are symptomatic of progress, retardation and unfitness for work. Such a list of topics could be much extended even now and is being increased rapidly as more psychologists and more gifted psychologists come to share in the study of the learning process.

Only twenty years ago a student could do little more than add to his own common-sense deductions from the common facts of life the ordered series of similar deductions by the sagacious Bain. Bain utilized all the psychology of his day as well as the common fund of school-room experience, but today his book is hopelessly outgrown. Although it was the source of the minor books on the topic during the eighties and nineties, no one would now think of presenting the facts of the science of education by a revised edition of Bain.

Other lines of psychological work deserve more than mention. Incidental contributions from studies of sensory and perceptual processes, imagery and memory, attention and distraction, facilitation, inhibition and fatigue, imitation and suggestion, the rate and accuracy of movement and other topics-- even from studies made with little or no concern about the practical control of human nature -- sum up to a body of facts which do extend and economize that control. The special psychology of babies, children and adolescents is obviously important to education. False infant psychology or false child psychology is harmful, not because it is infant psychology, but because it is false.

[p. 12] I give only mention to these so as to save space in which to call attention to another relation between psychology and education which is not sufficiently known. The science of education can and will itself contribute abundantly to psychology. Not only do the laws derived by psychology from simple, specially arranged experiments help us to interpret and control mental action under the conditions of school-room life. School-room life itself is a vast laboratory in which are made thousands of experiments of the utmost interest to "pure" psychology. Not only does psychology help us to understand the mistakes made by children in arithmetic. These mistakes afford most desirable material for studies of the action of the laws of association, analysis and selective thinking. Experts in education studying the responses to school situations for the sake of practical control will advance knowledge not only of the mind as a learner under school conditions but also of the mind for every point of view.

Indeed I venture to predict that this journal will before many years contain a notable proportion of articles reporting answers to psychological questions got from the facts of educational experience, in addition to its list of papers reporting answers to educational questions got from the experiments of the laboratory.

All that is here written may seem very obvious and needless, and meet the tragic fate of being agreed with by every one who reads it. I hope that it is obvious and needless, and that the relation between psychology and education is not, in the mind of any competent thinker, in any way an exception to the general case that action in the world should be guided by the truth about the world; and that any truth about it will directly or indirectly, soon or late, benefit action.

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