LOUIS CLARK VANUXEM FOUNDATION

# HUMAN EFFICIENCY

AND

# LEVELS OF INTELLIGENCE

BY

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LECTURES FOR 1919

# The Louis Clark Vanuxem Foundation of Princeton University

was established in 1912 with a bequest of $25,000 under the will of Louis Clark Vanuxem, of the Class of 1879. By direction of the executors of Mr. Vanuxem's estate, the income of the foundation is to be used for a series of public lectures delivered in Princeton annually, at least one half of which shall be on subjects of current scientific interest. The lectures are to be published and distributed among schools and libraries generally.

The following lectures have been published:

The Theory of Permutable Functions, by Vito Volterra.

Lectures delivered in connection with the dedication of the Graduate College of Princeton University by Emile Boutroux, Alois Riehl, A. D. Godley and Arthur Shipley.

Romance, by Sir Walter Raleigh.

A Critique of the Theory of Evolution, by Thomas Hunt Morgan.

Platonism, by Paul Elmer More.

# PREFACE

Without some word of explanation the reader might judge that the author of this book thought that intelligence was the sole determiner of human conduct. Such a view is of course inconsistent with the most obvious facts.

It happens however, that in the solution of this problem of human efficiency, we are just at present better equipped to evaluate the part intelligence plays, than any other of the psychological factors. It therefore seems worth while to solve our problem in terms of intelligence as though it were the only variable. The other unknown quantities may be considered when the part they play is better understood.

Let us solve our equation for $x$ now and leave $y$ and $z$ for later consideration when we shall know as much about emotion and temperament as we now know about intelligence.

If mental level plays anything like the rôle it seems to, and if in each human being it is the fixed quantity that some believe it is, then it is no

useless speculation that tries to see what would happen if society were organized so as to recognize and make use of the doctrine of mental levels.

Moreover if the views set forth in these lectures are in the main sound then it is quite possible to restate practically all of our social problems in terms of mental level.

For example, what could be done with labor and wages? Suppose we say men should be paid first according to their intelligence; and second according to their labor: e.g., "D" men are worth and should receive "D" wages; C men C wages (which are higher), etc. If a certain job requires D intelligence, D men should be employed at D wages. If there are not enough D men, C men must be employed at C wages. And it may be relied upon that they will be worth the difference because of their greater intelligence.

If, of two jobs each requiring D intelligence, one is more agreeable than the other and hence draws all the D men, the conditions must be evened up as far as possible by changing hours, etc., and then by increasing the pay for the less desirable job. A little experimenting would equalize the two jobs so that all would be satisfied. Doubtless other adjustments would be found necessary. But the great advantage of

having every man doing work on his own mental level would prove fundamental.

Testing intelligence is no longer an experiment or of doubted value. It is fast becoming an exact science.

The facts revealed by the army tests cannot be ignored. Greater efficiency, we are always working for. Can these new facts be used to increase our efficiency? No question! We only await the Human Engineer who will undertake the work.

It is hoped that the consideration of the topics of these lectures will help prepare the way for greater social efficiency.

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# INTRODUCTION

The topic of mental levels or "levels of intelligence" has been chosen for these lectures because while the subject is not altogether new it seems that there are phases of it that have not been dwelt upon but which enable us to look at some of the present day problems from a new angle, and suggest solutions different from any usually discussed.

Stated in its boldest form our thesis is that the chief determiner of human conduct is a unitary mental process which we call intelligence: that this process is conditioned by a nervous mechanism that is inborn: that the degree of efficiency to be attained by that nervous mechanism and the consequent grade of intelligence or mental level for each individual is determined by the kind of chromosomes that come together with the union of the germ cells: that it is but little affected by any later influence except such serious accidents as may destroy part of the mechanism.

As a consequence any attempt at social adjustment which fails to take into account the determining character of the intelligence and its unalterable grade in each individual is illogical and inefficient.

## MENTAL LEVELS

In one sense the doctrine of mental levels may be said to have had a lowly origin. On June 10th, 1903, Earl Barnes in concluding an address before the Corporation of The Vineland Training School for Feeble-Minded Girls and Boys, said: "To me Vineland is a human laboratory and a garden where unfortunate children are cared for, protected and loved while they unconsciously whisper to us syllable by syllable the secret of the soul's growth. It may very well be that the most ignorant shall teach us most."

In October 1904 the Minister of Public Instruction of Paris named a Commission which was charged with the "Study of Measures to be taken, Showing the Benefits of Instruction for Defective Children." This Commission decided that no child suspected of retardation should be eliminated from the ordinary school and admitted into a special class without first being subjected to a pedagogical and medical examination from which it could be certified that because of the state of his intelligence he was unable to

profit in average measure from the instruction given in the ordinary school. But how the examination of each child should be made the Commission felt under no obligation to decide. To one member of that Commission, however, it seemed extremely useful to furnish a guide for future Commission examinations. That member was Alfred Binet. He felt strongly the need of a scientific method of determining what children needed this special treatment. He says, " To be a member of a special class can never be a mark of distinction, and such as do not merit it must be spared the record." With this feeling Binet set to work upon the problem devoting the energy of his marvelous intellect and a large part of his time for approximately seven years to the developing and perfecting of a measuring scale for intelligence.

In 1906 the Vineland Laboratory was opened for the psychological study of feeble-mindedness. Those who are especially interested in the origin and evolution of ideas may be interested to ponder over the problem of how there should originate in two nations widely separated, different in language, and without collusion or suggestion from one to the other, the same idea though motivated by very different purposes. The French-

man having the very definite and practical objective of determining who were the children who needed special education. The American having a vague conception that these same defectives might "unconsciously whisper to us syllable by syllable the secret of the soul's growth, and, thus, the most ignorant teach us most."

It was not long, of course, until these two streams of independent origin flowed together and out of them has grown the theory of mental levels.

It is often easy after a theory has been scientifically demonstrated to discover that there is nothing new about it. We have accepted and used it for long only under a different name, or without realizing its far-reaching significance. It is certainly not new to declare that a two-year old child is at a higher mental level than a one-year old. A child of ten is of higher intellectual development than one of six; and so far, it is true there is nothing new in the theory of mental levels. Throughout childhood the human being rises to an ever higher level of intelligence, but beyond this we had not gone, perhaps never would have gone had not the genius of a Binet given us the means of extending the principle. As so often happens in human affairs it is the part

that is just beyond the obvious that proves to be of the utmost value. When gold was discovered in the Black Hills it was not long until the visible supply was exhausted, and at that time it was little realized that the rock, which to the placer miner was of no use, would one day furnish the material for the most profitable mining operation in the world.

It is a matter of every-day observation, as already stated, that children as they grow rise to a higher and higher level of intelligence. But two facts were unappreciated and even yet are so little recognized as to make the whole matter "a theory" in the minds of most. These two facts are: First that the intellectual development is largely independent of what we call learning or knowledge; and second that not all develop to the highest level, or even near to it; many stop at some one of the lower levels of childhood. To produce the evidence for these facts and to draw some of the far-reaching conclusions therefrom is now our task.

That we may approach the problem with unbiased minds it will be well to first remove some of the obstacles. First let us state the theory more succinctly than we have yet done. The theory of mental levels holds that every human

being comes into the world with a potentiality for mental development that will carry him just so far and that barring those accidents that may stop a person from reaching the development which would have been normal to him, nothing can, to any great extent, effect the mental level to which he will finally attain. Why is this view hard to accept?

Probably the first and most important reason is that we have generally confused intelligence with knowledge. Having no way to evaluate either one we have been lost in the intricacies and confusion results. At this point I should like to define each one but unfortunately we are unable to. We do not know what intelligence is and it is doubtful if we even know what knowledge is. This however need not frighten us since man works with and makes use of many things which he cannot define. For example electricity, which we can measure, control and use, but the exact nature of which has never yet been ascertained. We may point out that intelligence is an inherited force while knowledge is wholly acquired. Moreover they are not to a large extent inter-dependent. It is true that one can not acquire a high degree of knowledge without having some intelligence and the highly intelligent per-

son certainly acquires knowledge because it is of great use, but, a person may have knowledge that is out of proportion to his intelligence and vice versa.

The last statement especially forces us to make at least an attempt to define our terms. What do we mean by intelligence and what do we mean by knowledge? We have said that the one is inborn, the other acquired. Intelligence is the potentiality of the machine. Knowledge is the material upon which it works. Knowledge is the raw material. Intelligence determines what we do with it. The effectiveness of a machine (what it can do), depends upon its structure and its functioning. Likewise, intelligence is dependent upon the structure of the brain cells which condition given mental processes, and second, upon the functioning of those cells.

A hand printing press is a machine of very simple structure and has a simple function of spreading ink upon paper according to a prearranged plan. Its structure may be of the simplest, merely a square block of metal, wood or rubber cut into the desired form upon which the ink is spread and then the block placed against the paper. Twenty-six such blocks used individually in the prescribed order is sufficient to put

upon the paper any message in the English language and by repetitions of the process one can make as many copies as one likes. This would be an example of very simple structure and a very simple functioning. We may elaborate the structure of this machine so that it will hold together the different blocks in the prescribed order so that they can all be impressed at once upon the paper. We have thus elaborated the structure slightly and extended its function and thus attained to a higher level of printing.

A higher level is reached when we elaborate the structure by the addition of guides, wheels and levers so put together and arranged that it is only necessary to place the paper of the right size in a particular position and the copies are produced as rapidly as the paper can be placed.

A still higher level of structure and functioning is attained when the machine is so elaborated that it is only necessary to place a pile or a roll of paper in a given position and the machine picks up a piece of paper, places it under the type, prints it, puts it out of the way and repeats the process. And so by adding new structure to our machine in such a way that new functions are possible, we may finally arrive at a machine that needs only to have a supply of the raw material

in the shape, for instance, of sheets of paper cut in a definite shape, when it will pick up the paper a sheet at a time, print it, spread glue on certain prescribed edges of the sheet, fold over and press together some of those edges until we have an envelope which continuing through the machine, the gum on the flap is dried and then the flap is folded over and the completed envelopes are counted, pushed out, grouped in packages of twenty-five, a band placed around the bundle and dropped into a box. The structure of such a machine is exceedingly complicated and the functioning is so surprising that it is a common remark that the machine is "almost intelligent."

We, thus, have a very high level of mechanical efficiency. This is comparable to intelligence. This machine may exercise its complete function upon paper and a printers ink made from lamp black and oil. These are the raw materials comparable to knowledge. But the same machine is capable of using other raw materials. It may use innumerable kinds of ink made from widely different substances. It may print upon paper of many different kinds, upon cloth, wood, metal and numerous other substances. It may make envelopes of different sizes and shapes with no change of its structure and only a slight change