

I. By E. L. THORNDIKE,  
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1. *The nature and measurement of intelligence.* If we inventory the behavior of men and try to divide it up according as intellect, character, skill, taste or temperament is primarily involved, we shall agree fairly well in, say, ninety per cent of the cases. If, however, we try to make the division absolute we may agree very seldom. It is probably unwise to spend much time in attempts to separate off sharply certain qualities of man, as his intelligence, from such emotional and vocational qualities as his interest in mental activity, carefulness, determination to respond effectively, persistence in his efforts to do so; or from his amount of knowledge; or from his moral or esthetic tastes. Even so apparently remote a trait as muscular strength may in some cases cooperate almost indistinguishably in the production of what we would all call intellectual products. Thus a great scholar's achievement may be in part due to eye muscles which help make reading a pastime.

Taking these cases of behavior which are generally accepted as matters of intellect and trying to place each as primarily a matter of response to situations directly sensed, or as primarily a matter of planning, we shall again agree fairly well. So also if we rate them as primarily responses to concrete particulars or primarily responses to abstract qualities and relations. It would however be difficult and probably unwise to try to separate off *sharply* the responses concerned with directly sensed situations from responses concerned with planning; or those concerned with concrete features of things and men from those concerned with ideas and symbols. Hoeing corn and shooting a rabbit are easily distinguished from studying botany and ballistics, but behavior shows all sorts of intermediate forms.

Realizing that definitions and distinctions are pragmatic, we may then define intellect in general as *the power of good responses from the point of view of truth or fact*, and may separate it according as the situation is taken in gross or abstractly and also according as it is experienced directly or thought of. The power of good responses to abstract qualities and relations rather than gross total facts and to ideas rather than direct experiences may be called the more intellectual variety of intellect.

Either variety is, as human beings now are, specialized further according to the data operated on in the response and according to the form of the operation. The goodness of the response in any individual varies according to the particular task. The child who is the best of a thousand of his age at the undoubtedly intellectual task of mental multiplication of two-place numbers will not be the best at the equally indubitably intellectual task of thinking out verbal puzzles. As we change the task from space relations to animals, to plants, to machines, to moral issues, to numbers, the correlation never holds up to 1.00. As we change from accuracy in perception, to accuracy in memory, to accuracy in inference, all with the same data, the correlation again fails to hold at 1.00.

A part of this break to below perfect correlation is presumably due to circumstances of life and training which have given unlike amounts of emphasis to different data and to different forms of operation in the case of each of the thousand. But if a thousand were taken who had had identical training, it seems certain that the specialization of intelligence would still be found, the correlations still failing to be unanimously 1.00.

In measuring a person's general status in intelligence and in inferring therefrom what his rank in native intellectual capacity in general is, what we do is to test him with a fair sampling of data and operations. If his opportunities of training in respect to these have been inferior or superior to the group with whom he is to be compared we make the necessary allowance. This sampling should be wide enough and its various components should be easily enough weighted, so that the resulting judgment should be about his *general* status and *general* capacity—if we are to claim that it is general.

Some of us have, I fear, claimed a generality for our measures of status and a surety of inference from them to original inborn capacity which it would be very hard to justify. The estimates which the psychologist makes with his tests are much better than those which parents or teachers or ordinary medical practitioners make of the same facts, so that we are justly proud of them, but we should be the first to recognize their limitations. The value of a test score is its value in prophesying how well a person will do in other intellectual tasks. Our claims may wisely be limited to the actual demonstrated power of prophecy. For example, consider a score attained by a 12-year-old boy in say a combination of Stanford Binet, National A and

B and Haggerty Delta 2 (two trials of each). If the boy has had ordinary American opportunities, this score will prophesy rather accurately how well he will respond to intellectual demands in the cases of "book-learning" at the time and for some years thereafter, and very possibly for all his life. It will prophesy less accurately how well he will respond in thinking about a machine that he tends, crops that he grows, merchandise that he buys and sells and other concrete realities that he encounters in the laboratory, field, shop and office. It may prophesy still less accurately how well he will succeed in thinking about people and their passions and in responding to these. We know that, taking people as we find them, the ability measured by verbal tests is not the same as the ability measured by non-verbal tests; and there is reason to expect other similar specializations.

The intercorrelations of these various "intelligences" are, of course, high enough to make a measure of any one of them a better index of any other than the average parental hope or teacher's opinion is likely to be. If our 12-year-old boy is at the five-percentile station in our tests it will rarely happen that he will rank above average intelligence over any large area of mental activity; save by the drive of a great interest and the expense of much time upon the activity in question. On the other hand to assume that we have measured some general power which resides in him and determines his ability in every variety of intellectual task in its entirety is to fly directly in the face of all that is known about the organization of intellect.

The relative weight to be attached to analytical and selective and to perceptual and simple associative processes can only be decided by the correlations and partial correlations of these with the criterion which the test score is to prophesy, or some experimental facts giving equivalent information, considered with due reference to the time-cost of making the prophecy. In general, tasks which require efficiency in analyzing a situation into elements, selecting and weighting elements to fit a problem and organization or thinking many things together seem to give much better results per dollar or hour of cost. They perhaps include and sum up the action of many simpler associative processes. But a straightforward information test is also a valuable element. If time-cost is disregarded, a sampling of every kind of intellectual operation, and with every kind

of *datum*, will, if properly weighted, improve the prophecy of *general* intelligence. Unless it is properly weighted, however, it may injure it.

2. *Next steps in research.* Having used up my allotment of space in the previous discussion, I can only note that more research into every feature of intelligence and its measurement is needed, especially researches on the intercorrelations "total" and "partial" of the various forms of intellectual work of the world; on the intercorrelations "total" and "partial" of the abilities used and usable in our tests; on the permanence of our IQ's and EQ's; and on the "total" and "partial" correlations of each test at each age with itself at later ages and with each feature of the intellectual work of the world. The form of distribution of intelligence in the general adult population is also a matter of great practical moment. In relation to educational and industrial uses the problem of the effect of 'coaching,' special and general, is fundamental.

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II. By L. M. TERMAN,  
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1. *The nature and measurement of intelligence.* Meumann has pointed out that the fault of Stern's teleological definition of intelligence as "general adaptability to the new problems and conditions of life," lies in the fact that it furnishes no clue for judging the value of different kinds of adaptation. Meumann would reverse Stern's procedure by first finding out what is demanded of intelligence and then analyzing the mental functions which meet that demand. In my opinion this is the only method of approach which will bring us any nearer to a psychological solution of the intelligence problem.

If we accept this view it is evident that the important intellectual differences among men will not be found on the sensory, perceptual, or purely reproductive level. It is well known that a moron may be able to see, hear, taste or smell, react to a signal, balance a bicycle, steer an automobile, or cancel A's about as well as an intellectual genius. The latter would be somewhat his superior in memory for non-sense syllables, would excel him still more in logical memory, and would outclass him hopelessly in the ability to distil meanings