

Intelligence is impossible to define or measure?

In this essay, I will attempt to trace the development of the concept of intelligence and the various different ways of measuring it. I will discuss, starting from the early twentieth century, how intelligence first became of so much importance and of how the knowledge and understanding of the concept of intelligence has increased throughout the century. I will briefly describe the origins of the concept of intelligence and I will also mention the most recent developments in the subject such as those of multiple intelligences and artificial intelligence (AI).

Various definitions of 'intelligence' have been produced and psychologists have so far been unable to agree on a common definition. This indicates the complexity of the subject and the diverse ways of looking at it. Some of the definitions used during the twentieth century will be mentioned.

The continuous controversy as to whether intelligence is influenced mainly by hereditary or environmental causes will also be discussed.

As concepts such as 'intelligence' are always value laden, the political and ideological consequences of intelligence testing will also be briefly explored in relation to educational and racial issues.

The issue of intelligence and intelligence testing first came about within the problems of the education system. Teachers found that some children made slower progress in their studies, and explained this in terms of 'deficient capacity'. The school administrators found this explanation too simple. They believed poor academic performance could have been due to insufficient teaching. It became of some importance as to whether the cause lay on the individual or in the instruction. According to C.J. Adcock (1965, p.181) "It was this educational problem which led to the first effective tests of intelligence".

In 1904 in France A. Binet and Th. Simon were asked to create an intelligence test that looked at the problems associated with children who could not learn. Their objective was to devise a way of assessing intellectual performance. A test was constructed to assess the performance of children that were not doing so well as the rest of their peers. Binet and Simon were the first to devise such an intelligence test in order to assess a child's ability and to detect the 'defective' children. This was to provide an answer to teachers who complained about some children who were considered to be ineducable. A child's mental age was determined by their level of error - for example lower performance on tests as compared with the age-related norm.

Garlton also produced a number of tests in connection with his interest of human heredity and is regarded one of the most important pioneers in the development of mental testing. James Mckeen Cattell also was the author of several tests; he was the first to actually use the term 'mental test'. However it was the work of Binet and Simon that helped the development of mental testing get underway. Binet's approach was the asking of a variety of questions, which could be answered at different stages of development. From this it was possible to get a measure of someone's mental age. However, if one wished to compare the intelligence of children of different ages, this proved problematic. It was argued that there would have to be something more than just mental age. For instance, the older child might have a greater mental age but be less intelligent in that his/her mental

age was less than average, whilst the younger one might have a lower mental age than the older child yet have greater than the average of its age group.

Therefore given the need to compare children of different ages, Stern, a German psychologist suggested the Intelligence Quotient, known as I.Q, which is the mental age divided by the chronological age, multiplied by one-hundred. If the two ages are the same then the I.Q is one hundred and the child is deemed to be of average intelligence. If, however, the mental age is higher, then the I.Q exceeds one - hundred.

However, nowadays for any good intelligence test three characteristics must be involved: 1) the test must be reliable, in other words it must consistently give similar results. This can be shown by the test re-test method. 2) It must be valid; this means that it measures what it claims to measure. Here it may be pointed out that there are three different ways of assessing validity: content validity, empirical validity and construct validity. 3) It must be standardised; this means that it must be representative of the population in question, so the individual scores can be compared against the standardised scores. A normal distribution is normally produced from the large sample of the population tested and individual subjects are located within the distribution, which is measured in standard deviations from the mean.

It must be mentioned here that IQ tests, whether psychologists liked it or not, gave rise to discriminatory practices. Children were labelled as 'idiots', 'morons', 'imbeciles' and so on according to their IQ scores. This stereotyping led to the development of an educational system that favoured the higher scoring middle class children and penalised and excluded the low scoring lower class children. IQ tests were also used to prove the lower mental abilities of other races (i.e. blacks) and therefore to justify white superiority. This however was later shown to be due to cultural bias in the construction of IQ tests. R. Davies and P. Houghton (1995, p.156) stated that " There is no doubt that different racial groups perform at different levels on IQ tests, which were designed by and for people from European and American cultures". They also argued against the term 'racial' for differences between different national groups.

Spearman (1904) suggested a mathematical approach. Spearman defined intelligence as being a 'general ability'. He had been studying and testing children, and paid particular attention to correlations of ability that occur between specific objects. He found that some performed well in the entire range of tests given, where as others performed at a below - average level. Spearman investigated many tests in this way and found that even tests that were not supposed to be intelligence tests correlated with one another and also with the tests that were supposed to be tests of intelligence. From these results according to R. Davies and P. Houghton (1995,p.152) "...he concluded that a child's performance on any test will depend upon that child's broad level of general ability, which he referred to as 'g' (general intelligence)." Spearman also thought that test performance was also dependent upon a number of specific abilities relevant to the task, which he referred to as the 's' factors. Later on Spearman expressed the view that 'g' could be genetically determined.

Later on Guilford argued, that intelligence is a collection of segregated abilities and in 1967 he identified 120 factors making up the structure of human intelligence. It may be

argued that Spearman's 'g' and Guilford's factors represent two different approaches, which are influential in Britain and America respectively (ibid. p. 153).

As far as definitions of intelligence are concerned Thorndike was one of the first to argue in the early twentieth century that intelligence "is the quality of mind... in respect to which Aristotle, Plato, and Thucydides.... differed most from Athenian idiots of their day" (M. Eysenk, 1998, p.408).

Later on in the 1920s a different kind of definition was formulated "intelligence is what is measured by intelligence tests". Despite its obvious circularity, R. Davies and P. Houghton (1995, p.146) refer to it as a 'pragmatic definition', provided a clear explanation of what IQ tests are attempting to measure is given. A more valuable definition is provided by M. Eysenk (1998, p. 408) who states that "...intelligence involves the capacity to learn from experience and to engage successfully in problem solving and abstract reasoning".

It is clear from what has been said above that there is no agreement on a common definition of intelligence. However, a definition, which has been accepted in line with the opinions of most experts, is that of Sternberg (1985). This has been a more acceptable kind of definition - "mental activity directed toward purposive adaptation to, and selection and shaping to one's life" (M. Eysenk pg. 408).

The question as to what extent intelligence is determined by environmental or hereditary factors has led to a number of studies being carried out. Some psychologists such as Hebb have argued that the issue of the relative roles played by heredity and environment in determining intelligence is essentially meaningless. Hebb drew an analogy between addressing the issue and asking whether its width or its length determines the area of a field. The area of a field, obviously depends crucially on both length and width, so therefore Hebb asserted the importance of recognising that intelligence depends on both heredity and environment.

Studies such as twin and adoption studies are a very good way of investigating this problem. Burt was the first to seriously investigate twins. His extensive studies 'proved' the dominant part played by heredity in determining intelligence. He looked at identical twins that were separated in early childhood and were brought up in different environments as well as fraternal twins. His conclusions as to the importance of hereditary factors were very influential at the time. However, later studies could not replicate Burt's findings and as a result his reputation as an unbiased researcher suffered.

The close similarities found between the separated twins, in twin and adoption studies could be explained by the similarity in upbringing before separation took place; and also by the similar environments chosen by adoption authorities i.e. the social workers involved trying to match the adoptive family's characteristics to the biological family's ones. (Race, social class, cultural background, etc). Capron and Dyne (1989) suggested that heredity and environment are both very important in the development of intelligence.

Another important development, which has given us a deeper understanding of human intelligence, is research carried out into Artificial Intelligence (AI).

This new development is helping us develop an understanding into how the human brain works by replicating the human way of thinking using machines. This is a more recent exploration to understand the mental processing of information which is called the 'information processing' approach. It is specifically concerned with modelling the mind using computer programmes. Turing (1950) argued that if a computer could make responses to a human in such a way that the human could mistake the computer for another human, then the machine could be said to 'think' as humans do. Another Turing test is that of the Church - Turing hypothesis, which proposed that whatever is human - computable, is also machine - computable. It is now being used to model how human vision and memory work. This has enabled psychologists to formulate more precise models of how the human brain operates.

Recently Gardner introduced his theory of multiple intelligences and claimed we all have seven different intelligences - spatial, musical, linguistic/mathematical, interpersonal, intrapersonal and bodily - kinaesthetic. He later spoke of eight and later still of twelve intelligences. The original IQ tests focused on the verbal, mathematical, spatial etc abilities in order to segregate pupils into high and low achievers. This resulted in a segregated educational system: the grammar schools for those who passed their 11+ and the rest who had to follow a more mediocre education and end up in lower paid jobs. Gardner's theory however opened up more options and resulted in an education system where it was not the pupils' fault for not progressing. The onus is now placed on the teachers to make the curriculum accessible by using more than the traditional (mathematico - linguistic) intelligences. Each person is now seen as possessing a combination of those intelligences to a greater or lesser degree. The job of the educationalist is to cultivate as many of the intelligences as possible and to find each pupil's favourable style of learning.

However Gardner has been criticised as not explaining the relative importance of his intelligences; for example the musical and kinaesthetic intelligence, seem to be of less value than the other intelligences in the western world.

Gardner has also been criticised for arguing that his intelligences are separate and independent from each other. In fact he argued against the concept of a general intelligence ('g'). Although it has been proved that there is a correlation between all of his intelligences. This indicates the existence of Spearman's 'general intelligence'.

Gardner has also formulated a more pragmatic definition of an intelligence, which takes account of people's different cultural backgrounds. It is " an ability or set of abilities that permits an individual to solve problems or fashion products that of consequence in a particular cultural setting" (M. Eysenk, 1998, p.423).

To conclude, having traced the historical development of the concept of intelligence and the various attempts at measuring it, it is clear

That consensus on the matter is difficult to achieve. However a number of worth while attempts have been made at defining intelligence. Comparing the early definitions to the more recent ones, one notices the progressively more objective, down to earth, real life approach as expressed by Gardner, compared to the more intangible "quality of mind..." proposed by Thorndike.

Also approaches of intelligence testing are becoming less important, as the emphasis is shifting towards a broader spectrum of intelligences and the approach is focused on how to help people develop their intelligences rather than for discriminatory practices. Testing is of course still important when one is looking for specific abilities and aptitudes, but it is nowadays, carried out by 'profiling' the people in question.

So despite the controversial nature of the subject I would conclude that it is not impossible to define intelligence - only very difficult to agree on one particular definition. Also it is not impossible to test intelligence - only very difficult for psychologist to agree on a particular method of measuring IQs.

As long as there are different theoretical approaches, there will always be differences of opinions, but this does not stop psychologists and businessmen from using psychometrics to help them decide who to employ and who to let go.