Human Behaviour
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Lecture - 14
Intelligence – II

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Friends, welcome back to this lecture number 14 on the series on Human Behaviour.

So, just for a little recap what we have been doing up till now. I will recount all that we have covered. So, we started off by defining human behaviour, and pointing out that psychology is the science of doing human behaviour. Then we looked at where did this psychology comes from: it is a historical routes, its various schools, how these schools interact with each other. And then to this process, explaining a little bit of history psychology which is the science which studies human behaviour. For that wait, I also discussed some tools methods that we used in psychology for studying human behaviour.

So, the courses on human behaviour started off well, with the definition of the science or psychology which studies human behaviour. So, behaviour we described is any action or reaction that a person does in response to either an external or a internal stimuli. And so, in natural sequence the second step was to discuss how do human beings translate external stimuli in the environment, which is outside of them or even within them into the psychological domain. And then we discussed the idea about sensory receptors which

are organs which code the external stimulus or the external environment into the psychological domain. We looked at sensitivities and sensory coding; these are the properties of the sensory systems.

We further looked at some more elaboration on the sensory receptors. And towards the end we took a model system which is the human eye, and looked at how human eye course sensory information. So, for any human to any behaviour or a response the first step would be to code or to understand what is coming from the stimulus in the external environment.

Once you are able to code, this code has to be then narrated or explained in terms of the language of the brain; and that is called perception. It is the idea or the process or a bunch of systems and processes which make meaning from the sensory information, which has been encoded through the sensory receptors. And so we started off by looking at what is perception, how is meaning generated. We looked at the need for two eyes. We looked at how human eye perceives depth, and the process of recognizing external stimuluses pattern recognition, the process of abstraction and consistencies which are used by the brain to make meaning.

So, once we understand what the external stimulus means we need to learn it and then came the section of learning. In the section of learning what we did was he looked at what is learning. So, learning is basically changing unbehaviour or changing behave in a certain way in this processed what does it mean acquired through perception. So, we looked at two basic types of learning. We looked at the reflex type of learning which is non-associative and the associative form of learning. We discussed **habitualization** and sensitization as the reflexive or the non-associative form of learning. And then we discussed classical conditioning which is reward conditioning learning.

So, a reward is given up front for a person to change his behaviour or to learn. Operand conditioning in which the consequences of the behaviour leads to the reward or punishment as the matter maybe. And observation learning in which a person observes a role model doing a particular behaviour and learns from the role model what is the appropriate behaviour in a particular situation.

So, this process of learning or this whole process of how do we acquire knowledge or how do we extract knowledge from the meaning that is been generated through

perception. Once the knowledge has been gathered, and this knowledge is stored somewhere so that at a future date when a situation this like the stimulus situation; a situation like a previous situation occurs the most optimal behaviour could be displayed. And this process of storing is what is memory.

So, we started off by discussing what is memory, we looked at the definitions on memory or understanding a memory in terms of the Gibsonian view and the complex view of memory. Then we discussed two important view points of looking at memory the active model and the idea about parallel processing model. We then focused on the idea of working memory which is an extension of the idea of the short term memory. And finished our discussion by looking at the kind of information which is stored into long term memory. So, in elaborate we discussed the idea of what is short term memory long term memory factors effecting it all those kind of things.

So, once we were done with memory, we moved into the idea of intelligence; that is what we did in the last class. We looked at what is intelligence and how does it really work. So, will we define the concept of intelligence and we also looked at how intelligence is basically defined and why it has difficult to understand intelligence.

Now in the previous lecture which is 13, we discussed the two popular notions of intelligence which is the idea that intelligence is; a single factor based property and the idea that intelligence is the multi factor based property. This is the exactly difference between what Spearman says what intelligence is and what Thurstone says intelligence is. Spearman believes that everybody has a G-factor, and this G-factor is responsible for all the intelligence in the world.

And then this G-factor correlates to some specific factors which are called the S-factors, this specific factors are situation related intelligences. Thurstone, on the other hand believes that there is no G-factor, there is no basic intelligence, but there are different intelligences which combine together to form the concept of intelligence. We started defining or evaluating the idea of multifaceted theory of intelligence with the theory of Thurstone, and the extension of this theory through Wardner where he talks about 7 or 8 intelligence types. We moved on to the concept of Anderson's information processing theory of intelligence, where we looked at intelligence not only as the speed of how quickly somebody processes information or also dependent on development of certain

modules, which could be characterized intelligence. We looked at the idea of Sternberg's Triarchic Theory of Intelligence which says that intelligence is three types: intelligence is performance based, intelligence is experienced based, intelligence is environment based. So, three different types of intelligence is we have discussed in detail.

And the last theory that we did was Cattell's idea of fluid and intelligence. And then the idea of Ceci's that is what you have seeing on the board right now. The concept of Ceci's theory of intelligence which says that the environment has lot of role to play in intelligence. So, what we are going to do today? What we are going to do today is we are going to look at how do we measure intelligence first of all.

So, we look at a standard test of intelligence because more applicable then the idea of intelligence is the concept of how intelligence is measured. So, we look at how any intelligence tests is actually created first of all, what are the parameters of those tests, how it is created.

How did the intelligence measurement started, because intelligence is all about terms of measurement in numbers, so what is the meaning of that? Then we look at some basic ideas in terms of theories of intelligence measurement. So, where it started, how it is measured, different forms of intelligence tests, and finally we look at a model system of intelligence which is called emotional intelligence. Now there are several concepts of intelligence like emotional, intelligence, spiritual, intelligence and so on and so forth. So, we look at a model system which is the idea of emotional intelligence and creativity.

So, let us start by looking at two parameters of what really intelligence test should have, and how these parameters define what intelligence test is or how good a intelligence test is. Now, for those of you there who have had gone to schools, who had school councilors and have done intelligence tests they will be familiar that most intelligence tests tend to have several questions on them. It could be numerical ability, it could be verbal ability, it could be performance ability, it could be a number of abilities spatial ability and so on and so forth. So, most intelligence tests have a number of abilities. But then let us look at a standard test, let us look at how tests are constructed, and two parameters of any intelligence tests let us start by looking at that. Because I have said more interesting then the idea of intelligence is the idea of intelligence tests.

So, we start of by looking at how intelligent is assessed. Now assessment of intelligence key that they measure what they intend to measure. Intelligence tests the key to any intelligence tests whether it is Weschler's intelligence tests or it is Binet's intelligence test or for that matter any intelligence test; the key to any intelligence test is that it actually measures what they intend to measure. And as I have said there are several types of intelligence tests: you can have a ability based intelligence tests, you can have a academic based intelligence tests, you can have a performance based intelligence tests and so there can be several types of intelligence tests.

Now we will move into the idea of how this works, but before we go there let us look at two factors or parameters which effect intelligence tests. The first factor is called reliability; what is reliability of a test? Let us say that we go to a cloth house a cloth merchant and we get 1 meter cloth, see if you go to any shop which sells cloth and you ask them a 1 meter of cloth. How do they measure? Now, if he is a genuine person he will take out a scale a 1 meter scale is there wood or steel or metal scale and he measures the cloth against that scale and he cuts the cloth for you. Now if I do this on n different shops of cloth what I will get is nearly equal cloths.

How I am getting nearly equal cloths? The idea is that the scale is reliable, the metal scale is reliable what does the reliability then generally mean: it means is that now how many times I measure on a time basis on a time axis or time dependent the measurements

will not change. So, if I do a measurement again and again that different points of time of something whether it is measuring a cloth to the same scale the measurements will not change drastically and that is reliability.

So, the concept of reliability defined as "a test with good reliability will yield reproducible and consistent results". The key words here are reproducible, which means that in a cloth example if we take the cloth and we measure it across 6 or 7 shops the measurements will be more or less same, so reproducible. Or if we get a cloth from one shop and take it to the other shop and ask them to measure it will be same; the 1 meter 2 meter whatever you have buying it would be same and that is reliability. That is reproducible, and consistent results.

Consistent in the sense that across time. So, if I do it across periods of time, let us say today, tomorrow, 5 days, 15 days, 1 month, 4 months, 10 months whenever I do this test then the measurement that I get of the cloth is consistent it does not change; whatever measurement I get on one scale.

So, say shop 1 says it is 1.1 meter and shop 2 says it is 1.3 meters, 1.03 meters and 1.01 meter. And if I do a test today and I again go back let us say after 30 days the same results I will get in shop 1 and shop 2 of the cloths that I have. And that is called Consistency.

So, no matter what I do, how many times I go there the results are not only reducible, but also consistent.

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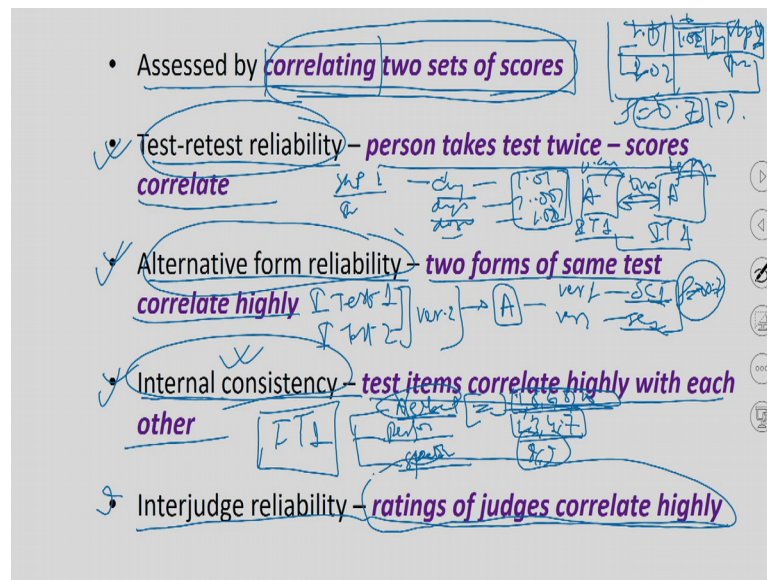
So, how do I measure reliability? The measurement of the reliability is done by correlating two sets of scores. Which means that the measurements that I am getting say: if shop 1 is giving me 1.1 meter and shop 2 is giving me 1.01 meters and it is 1.02 meters and so on and so forth, and when I correlate this score. So, shop 1 10 reading I take 1.1 meter next time 1.02 meters and then 1.00 meters so on and so forth procedure these are 10 readings of shop 1 and again for shop 2. And then I run a small correlation between them what is correlation.

If two variables they change in synchrony which basically means that if there are two measurement variables A and B, and whenever A makes a change in it or a shifts itself in position this leads to change in position of B also by either equal amount or some fixed amount, then they are said to be correlating. Which means that A happens and B also happens. It may possible that they are not correlating at the same length. And it might be that if A increases B may also decrease, and that there would be different amounts also. But when A happens B also happens at the same time, in terms of temporal fixation then we say that they are correlating.

So, here if I have a scores like this and I run a simple correlation; rho is what a correlation is and I get a correlation like 0.7 I say that these scores are high correlation; high positive correlation. Which means that both the shops are giving near equal results right; both the shops are giving near equal measurements. And so, the scales that you are

using are reliable that is one the metal scale they used for cutting the cloth is reliable. So, reliability is measured through this kind of a assessment.

Now there are several types of reliability. One form of a reliability is called the test retest reliability, which a person takes a test twice scores correlate. In test retest reliability what happens is. Assume that I go to shop 1 for measurement on day 1 I get 1.01, the same shop on day 5 I get 1.001, and then day 30 I get something let us say 1.02 and so on and so forth. When I run a correlation between these different based course and if it is highly significant this is called test retest reliability.

In terms of what has been explained here: suppose a person A takes intelligence test 1. And then again takes the same; A again takes the intelligence test 1 with the time difference between them. So, once they do the test and then again do the retest. So, let us say at 10 AM it takes the first test and at 4 PM it takes the test again. Now if the scores are correlating between test 1 and test 2 or the scores are similar between test 1 and test 2 then we said that the tests are have something called test retest reliability.

There is another with test reliability which is called the alternative form reliability. Here what happens is that two forms of the same test correlate highly. So, what we tend to do here is that: let us say that test 1 or intelligence test 1 and intelligence test 2 are two versions of the same test. [FL] You have seen this right. You have given your examinations J examinations, your CBSE examinations what happens is you get multiple set of papers. Now these sets do not vary too much what happens is that question are different and so two or three versions of the test.

Now similarly if there are two versions of the same intelligence test and the same both the versions are taken by let us say person A. So, it takes version 1 and gets a score say SC 1 and takes version 2 and gets a score SC 2. And when I do the correlation between the scores SC 1 and SC 2 and they correlate very highly which means that the rho value if this score increases this score increases in certain items, and this score decreases and this score also decreases on certain item which means that the rho value is greater than 0.7: I say that they are correlating highly and the test is formed known to have something called Alternative form Reliability. What has happened is: two form of same test is taken by people and they both the forms when the person performs on them they show high reliability.

The third form of reliability is called the Internal Consistency Reliability test items correlate highly with each other. Let us say I have a intelligence test IT 1. Now IT 1 measures three abilities: academic ability or I will I will let us say verbal ability, performance ability, and spatial ability. Verbal ability will have question related to verbal. Things for example: there will be passages things like if this is greater than that kind of a thing or some passage to decode from. Performance ability will be certain questions which make you perform, so mathematical ability kind of a thing. And spatial ability will be certain rotation: example, so if cube a rotates in a degree what it is going to be the final size. So, let us say that there are three abilities which the test is measuring.

So, there will be questions relating to verbal ability, performance ability, and spatial ability. Let us say question number 1, 5, 6, 8, 10, relate to verbal ability; similarly question number 2, 3, 4, 7, relate to performance ability; and question number 8 and 9 relate to spatial ability. Then if these questions individually correlate among themselves the test is said to have internal consistency. Which means that, the questions which is measuring verbal ability if this show high correlation the test is said to have or any matter of a for any measurement within the test; any factor which is measured inside the test if the question measuring the factors have a high correlation among themselves they are said to have internal consistency.

And the last kind of a reliability is called inter judge reliability, which is ratings of judge on correlate highly. There are certain measurements or there are certain factors which cannot be measured through computer test. For example let us say a beauty: how do you define beauty? Singing context you have seen; how do define singing, what is the idle and meaning of singing. So, what we do here is the measurement cannot be done through a computer test, we call an experts judges and these judges have their own base line and based on that they do the measurement or they give grace to people. So, there measurement is done through judges ratings. And that is called the Inter Judge Reliability.

So, if let us say 4 out of 3 judges give the same score to a person on a beauty context, then this test or this context is said to have something called inter judge reliability. And that is what is inter judge reliability.

Now, similar to reliability is another factor which is called validity. Now reliability is how good, how consistent, how reproducible your test is. Validity is whether your test is measuring what it is suppose to measure. Now there could be I could be have a test of happiness and I could have a questions like how many times did you cry today, and how often did you feel sad today. Now these questions do not actually measure happiness. And so, if a test does not measure what it is supposed to measure is said to have no validity. Now test with a good validity is the one which measures what it is meant to measure. So, if a test of happiness is there, it should measure it should have items of or it should have test items of happiness on to them.

Now, there are three types look at validity: one is called the criterion or empirical validity. What is it correlating test scores with some external criterion can assess validity. Let us say there is a test of happiness, already existing in markets, and I develop a new test. Now if my test gives the same score or nearly equals score to a test which is already there in the market and these scores match correlate highly, then we say that they have they have something called criterion or empirical validity which means that that particular test which is there in the market that that uses a criterion for measurement of happiness. And my tests gets scores similar to that. And so it is suppose to have something called criterion relevant validity.

Criterion problem in assessment: now there are certain things, certain features or certain type of constructs which cannot be measured or which has no criterion which has no test to measure. For example, a good example often given by psychologists is the idea of a achieve and motivation; how do we defining achieve and motivation.

Now, achieve and motivation I first being define there was no way to come up with a idea or there was no test out there to come up with a idea of what is an achievement motivation; what should I measure. Because the achievement motivation in terms of salaried employs will be salaried. Achievement motivation in terms of teachers will be how successful they are students are. Achievement motivation or some other group will be something else. So, how do I define questions for achievement motivation what are the factors which define achievement and motivation.

And so, where we do, what we do there is and this kind of a problem is called criterion related problem assessment. And so for achieving validity there what we do is where there is no truth against which to validate the test. Now if there is a truth, if there is a test out there based on which we can design our own test it is supposed to have criterion validity. But assuming the there are no test out there, there is no truth against which we can come up with or we cannot define a criterion. So, what we do there? We generally use something called construct validity.

Test scores correlate with the predicted outcomes or the theory underlying that research. So here what we do is, we look at all the theories which measure achievement motivation. So, we look at several theories which actually or the most popular theory that you want to define or that the most popular theory on which you want to base your test or achievement motivation. So, we looked at the theory and theory has certain outcomes. There is body of research which says that human motivation measures this, this, this; and then we take our test and we measure the scores.

Now if my scores of the test matches with the theorist prediction of what should be achievement motivation and they correlate highly. So tests scores; if my test scores correlate with theorists prediction the theory also says what is achievement motivation. And if the rho value is let us say, 0.70 I say that my test has something called construct validity. Because, the idea of a achievement motivation is defined by some theory the construct achievement motivation is defined by some theory. And if my test predicts

certain score, if it gives similar score to what the theory says then the test is proposed to have construct validity.

So, this is how we these are the two factors of any test: first whether it is reproducible or not, consistent or not, and second whether it measures what it supposed to measure or not and. So, that is what the two factors of any intelligent test is.

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Now I have a intelligence tests for you, you can do it on your own time.

The first one is done for you 24 hours in a day, and I will do the second one also it says 26 letters of the English alphabet, 7 days in the week. And so, as you can see this is how a intelligence test is or just have a intelligence test for you can do it in your own time.

So, how do we measure intelligence? What is the basis of measurement of intelligence? Intelligence measurement started with someone called Binet; Alfred Binet. Simon and Alfred Binet they were the first people who actually started measuring intelligence in Paris, because the school council in Paris called these people and said that design a test for measuring school going children; measuring the intelligence of school going children or abilities of school going children.

Now, even before these people actually came up with the theory Alfred Binet which is called the Stanford-Binet test, because in Stanford it was reevaluated the test was or Binet's theory or Binet's idea of intelligence. Long before that there was someone called Galten who defined an intelligence test, but his test never actually became popular, only his statistical technique became popular.

And so, what Galten did was he used the idea of Charles Darwin and designed a test. And he said that intelligence comes from inherited abilities. And so there are some intelligent people in the world, inherited intelligent people in the world, and there are some stupid people in the world. And there he believed that the wives are most intelligent. And so, his theories had some idea of what intelligence is said it is how quick visual accuracy verses reaction time verses so on and so. So, 5 and 6 abilities defined and said that most a English people or most white people have these abilities and they are very good intelligence. To prove his theory he took measurements from several people

who came to a fair in London at one point of time. Several intelligent people whom you believe a intelligent and took the measurements, but none of them correlate with each other and his theory fell apart. The first actually theory of a intelligence started with Alfred Binet, where the Paris Council asked him to define intelligence test.

So, Binet did not knew how to define intelligence. So, what did he do? The first attempt to measure intelligence was made by Alfred Binet and Theodore Simon on request of the Paris School Board. Paris School Board requested these two people to measure intelligence of school going children in Paris. So, what they said is please help us identify intelligent people or please give us a measure of how intelligence should be measured in school children.

So, what did Binet and Simon do? So, Binet and Simon decided to use items of two basic types. They first constructed a construct called intelligence and then they defined the test of intelligence. Now what does this test of intelligence have? The Binet Simon test had items which was so unusual that none of the children had prior exposure to them. So, some of the exam questions or intelligence questions which are given to people in intelligence tests were so unusual that none of the children actually were able to solve it. And some questions were so familiar that almost all youngsters would have encountered them. So, there are two kind of questions that were taken.

What Alfred Binet did was: I will explain through a chart here. So, let us say I am measuring the intelligence of 8 class students. The most 8 class students will be or lesser 6 class students. Most 6th class students will be of the age 11 years right, assuming that you start school at 5 years. So, if you start school at 5 years by 11 years you will give this test.

Now the intelligence test Stanford and Binet on sorry Binet and Simon had were having questions let us say from class 4 and 5. And this 6th class children have to solve questions from class 4 and 5 now these were the so familiar questions. There are also so familiar unfamiliar questions were these 6th class students were given questions from class 7, 8, and 9, maybe 7-8. So, unfamiliar that they had no idea 7 was not given may be 8 and 9 questions, were for class 8 and 9 questions were given to these people.

So, there are questions which they are very familiar, because they have been through this class and questions which they had no idea; and so that actually measured there IQ or

intelligence. So, IQ is the meaning then and now. How should we define meaning of IQ. So, this is what the Binet Simon test actually did. And based on the score that they got they gave them a value which is called IQ.

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What is IQ? IQ or intelligence quotient stands for intelligence quotient and is a quotient is that may precisely the scores. So, IQ is defined as this is the very old definition, so changed a lot of times. IQ is mental age by chronological age into 100. What is chronological age? Chronological age is the; so refer to the present last example chronological age is the age of the children who are actually in class 6. So, that said class 6 children are 11 years old. And mental age is the questions that children of class 6 can solve. So, maybe you can solve questions for class 9.

Let us say I am taking the IQ of AB. Now this AB is in class 6 and has a chronological age which is the biological age 11 years, and he can solve the problems of 9 class students. So, his mental age is 14, and so his IQ will be 14 upon 11 into 100, right. That is the IQ of this person. Now approximately around 110-120 is the IQ of this person right. That is how this whole idea of IQ came about.

Now there is one problem with the IQ scores what: at some point mental growth levels off or stops while chronological age continues to grow. Now the dynamics of the base suggests that by the age 13 years no new neurons are found. And so, the measurement of mental age in the sticker sense is this is the measurement of intelligence test in terms of

how many questions can you solve for which age. Now mental age actually should mean to how many new neurons you are actually developing or the brain is developing, because that that is signify the idea of concept of mental age.

And so, as a result the IQ scores began to decline after age 13 because what happens is that mental age starts growing down, there is no neurons growing and so your age mental age cannot go high. And that is how this should get fixated out of 13 years of age.

So, the definition of IQ today is changed. And today IQ simply reflects an individuals performance related to that of persons of the same age who had already taken this test. And so, nowadays the IQ is defined as your score against somebody who has taken. That test if nothing is do with age it is do with somebody who was actually taken this test and when you take this test what is the correlation between the both of your scores; that is how IQ is actually defined.

And given the fact that they have the same age. So, two 11 class people taking a similar intelligence test 1: how do they score? So, one score is 30 the other score is 40 the correlation between them we will tell the intelligence quotient or the IQ of these people.

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Now, the Stanford-Binet intelligence test typical example as I said: one is verbal reasoning vocabulary questions, comprehension questions, absurdities verbal relation; you can have quantitative question. For example, number series, education building, you

can have abstract reasoning questions, where you have patter analysis copying and you have short term memory questions. Bead memory; memory for sentences memories for digits memory and memories for objects.

And as you can see this test of intelligence which is Stanford and Binet test is actually an academic test. It requires you to have verbal skills, if it requires you to have reading and writing skills. But the problem is there are people in the world who have no reading and writing skills; not gone to school. What happens to them? Are they stupid? Because the intelligence cannot be measured through any of this. Look at the definition that is there of the intelligence.

So, that was one of the problem.

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Measuring Intelligence

Binet and Simon's intelligence test has one major drawback:

All contents of the test was verbal. To overcome this problem David Weschsler devised a set of tests for both children and adults that include *nonverbal, or performance,* items as well as verbal ones, and that yield separate scores for these two components on intelligence.

So, Binet-Simon's intelligence test has one major drawback. All contents of the test was verbal in nature. Now to overcome this problem David Weschsler devised a set of tests for both children and adults that included nonverbal or performance items. As I said most questions in the Simon and Binet test were actually verbal items. As a small children who have no verbal ability, so very difficult to come up with an example or to come up with the way to express the intelligence. Similarly people who have not gone to school, so no verbal ability it has very difficult for Simon and Binet to explain how to measure their intelligence.

So, Weschsler define a test which had nonverbal or performance items as well as verbal ones, and that yield separate scores for these two components on intelligence.

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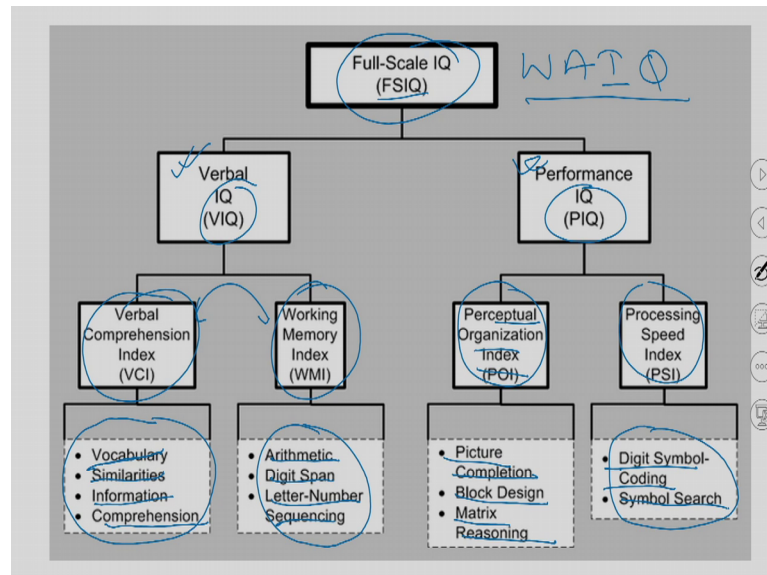
So, Weschsler later on defined something called the Weschslers Adult Intelligence Test. And this is what the Weschsler intelligence test look like, this is the Weschslers adult intelligence scale questioner. The full-scale intelligence quotient has two parts: a verbal part and a performance part; the verbal IQ and the performance IQ. The verbal IQ has verbal comprehension index and the working memory index; two things language and memory. As within the verbal comprehension index you have something called vocabulary test, you have similarities; so two items are given you have to find out how similar they are. Now test is given and you have to speak it may be read it get something out of it. Information: some kind of information is given to you and you have to actually relate that information back. And comprehension how good is your understanding.

The working memory test has tests of arithmetic how quickly you can do on math. Digit span: certain numbers are there in manipulated and how do you look into it. Letter number sequencing: for example, certain letters and numbers occur in sequences and you have to actually tell what is next in the sequence. Performance: test has two parts we have something called the perceptual organization index or the POI which has picture completion test or picture is given to you and you have to complete the picture. Block design: certain blocks are given and you have to complete the block in relation to a

picture. And matrix reasoning: so matrix is given and you have to move certain items to complete the matrix.

The processing speed index test has digits symbol coding. So, there are certain digits and there are certain symbols and a code is provided to that which is nonverbal and so you have to match it. And symbol search: so maize is given to you where certain symbols are hidden and you have to quickly find out where the symbols are reason version of the test.

So, this is the

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Now how does intelligence come about? The cognitive basis of intelligence, this viewpoints suggests that being intelligent involves being able to process information quickly. Now as we have seen Anderson's theory; what Anderson says is that being intelligent is equivalent to how quickly you can process an information. That was called basic processing speed in terms of in Anderson's theory. Now this is let to two major developments, the new information processing theory. First new tests based on findings of cognitive psychology emerged and due to this idea this information processing view of intelligence new a test start coming in. Also speed of processing simple perceptual and cognitive tasks correlate with scores on intelligence tests.

So, the intelligence tests factored being developed on idea of speed of processing; perceptual and cognitive tasks were device and which actually measure something called

speed of processing and that became the basis of newer intelligence tests. And the third important factor is inspection time. So, intelligence was now measured in terms of inspection time which is the minimum amount of time a particular stimulus must be exposed to acquire a judgment. That meets to some pre established criterion of accuracy is the new measure of intelligence.

What does the inspection time actually mean? You have seen Rubik cube. The time that it takes to you to get a Rubik cube solved; a Rubik cube has several colors mainly 6 different colors on different size and your job is to get all colors similar colors on one side. Now the how much time it takes for you to get all colors of similar type on one side, maybe solve one side may be solve all the sides is what is the inspection time.

So, number of moves. So, preestablished criterion is getting all greens on one side right. So, this is how my Rubik cube actually looks like. So, this is the cube right and so it has something like this and this is green. So, getting all greens on these are all colored green, and getting all green on one side is what is Rubik cube. So, preestablished criterion called the inspection time.

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Now, there is also the neural basis of intelligence and what does it say. This viewpoints suggest that nerve conduction velocity is responsible for intelligence. Now the speed with which nerve impulses are conducted in the visual system correlates significantly with the measure of intelligence. And so this idea says that how quickly information

passes from the eye through the nerves set of nerves the visual nerves to the visual context; that is defined as intelligence.

So, for some people its it moves at a very fast rate almost the 25 miles per hour is I think refer my second per hour is the a rate of nerve conduction velocity. That is the standard rate, but then it may vary from people to people and the more faster it moves in the within the visual system is defined as intelligence. Also, metabolic activities in the brain is a direct measure of intelligence. Intelligence people have different metabolic activities which means more of oxygen has taken up by the brain when they do a certain jobs and that is reflected in my different kind of activity in the brain or different kind of patterns in the brain. And this different kind of patterns represent and this difference is actually with a normal human being. Now what happens is seems said to be intelligence.

Also brain structures; certain brain structures are also known to have higher intelligence. For example, people with higher frontal context. Sherlock Homes used to have higher frontal context or a more developed frontal context and these known to be more intelligent So, because frontal context are known to do manipulations, decision making, working, memory all those kind of stuff it is related to; so different brain structures or higher or bigger hippo campus is known to have higher memory. So, different brain structures can also lead to the idea that people are intelligent.

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Human Intelligence: Role of Heredity and Environment

Human intelligence is the result of the complex interplay between genetic factors and a wide range of environmental conditions

Evidence for the influence of heredity

- Findings with respect to family relationship and measured IQ (It has been confirmed in experiments that the more closely two persons are related the more similar theirs IQ's)

So, human intelligence the role of heredity and environment. So, that is in also being talked to about that intelligence is related to heredity. Now human intelligence is the result of complex interplay between genetic factors and a wide range of environmental conditions. So, there are certain rules or there are certain kind of a evidences which has been given; evidence for the influence of a heredity.

The first evidence is with respect to family relationships and measured IQ; it has been confirmed that experiments that the more closely two persons are related the more similar their IQ. So, people related to together in terms of family has similar IQ and that says that heredity has an influence on intelligence.

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- Findings involved adopted children (IQ's of adopted children resemble more closely to they biological parents then the adopted parents)

- Findings from studies that focus on the task of identifying the specific *genes* that influence intelligence (the view argues that many *genes* each exerting relatively small effects, probably play a role in general intelligence – i.e., in what many aspects of mental abilities [verbal, spatial etc.] have in common)
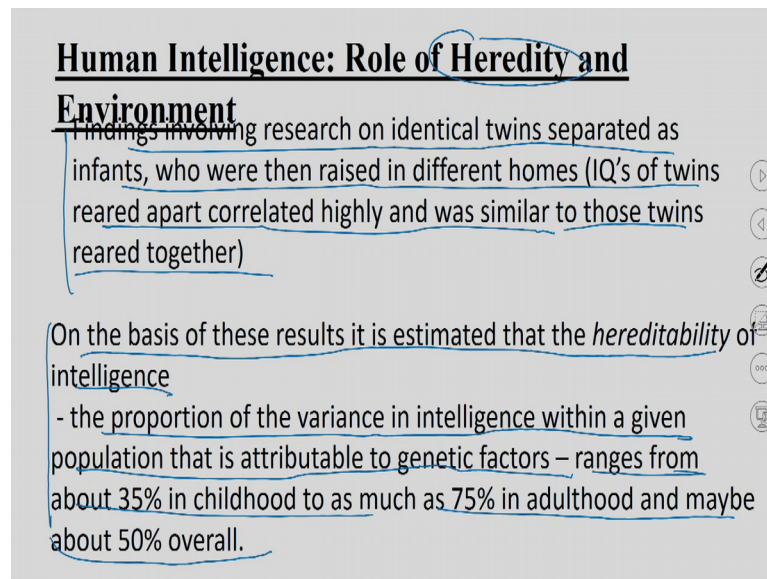
Similarly, findings involved adopted children: IQs of adopted children resemble more closely to the biological parents then the adopted parents. And so, it is found that there are two children and these two children are adopted by different-different families family 1 adopts the first child the family 2 adopts second child, the intelligence of these two child is different from. So, intelligence of child A and B which are in family 1 and 2 they will be similar to their biological parent then to their adopted parent.

Also findings from studies that focus on the task identifying this specific genes that influence intelligence. Now there are certain genes are known to have impact in show that intelligence is genetic in nature. The view argues that many genes each exerting

relatively small effects probably play a role in general intelligence that is in what many aspects of mental abilities verbal spatial and so have in common.

So, it has been found that certain genes or individual roles of a number of gene they combine together to actually come up with a idea of what intelligence is.

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The role of heredity and environment: as a findings involving research on identical twins separated at infants, who were then raised by different homes IQs of twins reared apart correlated highly with and was similar to the twins which are reared together. That is another finding. Now on the basis of these results it is estimated that the hereditability of intelligence. The proportion of variance in intelligence within a given population that is attributable to genetic factors; ranges from 35 percent in childhood to as much as 75 percent in adulthood and maybe about 50 percent overall.

So, it is said that basically the role of heredity in intelligence is approximately 50 percent in most adults and vary between 35 to 70 percent.

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Evidence for the influence of environmental factors

- Performance on IQ tests has risen substantially around the world at all age levels in the recent decade. This phenomenon is called the *Flynn effect*

A large number of factors are, responsible for such an effect – better nutrition increased urbanization, the advent of television, more and better education, more cognitively demanding jobs and exposure to computer games!!

Evidences for the influence of environment: So, performance on IQ tests has risen substantially around the world at all age levels in the recent decade. This phenomenon is called the Flynn Effect. What the Flynn effect says that as the generations developed the newer generations get more and more intelligent; the reason is that they have a better environment the better learning. And so, look at your children or may be your smaller brother and sisters, they are more intelligent than you are. They can operate response they can do, so many things that you at your age cannot do. And that basically Flynn effect it says: as generations move people become more and more intelligent.

A large number of factors are responsible for such an effect: better nutrition, increased urbanization, the advent of television, more and better education, and more cognitive demanding jobs, and exposure to computer games. And these are the reasons why this Flynn effect actually comes into place.

Another evidence for the role of environmental factor in intelligence is provided by the findings and studies of environmental deprivation and environmental enrichment; and what has happened is. With respect to deprivation it was found that intelligence can be reduced by the absence of key forms of environmental stimulation early in life also; as proof of enrichment, removing children from sterile restricted environments and placing them in favourable ones can increase the intelligence. It was found that the people or children in a better environment when in a enriching environment they tend to become more intelligent, but if I intelligent child is taken to a depriving environment then his intelligence decreases.

So, these are the evidences which are out there

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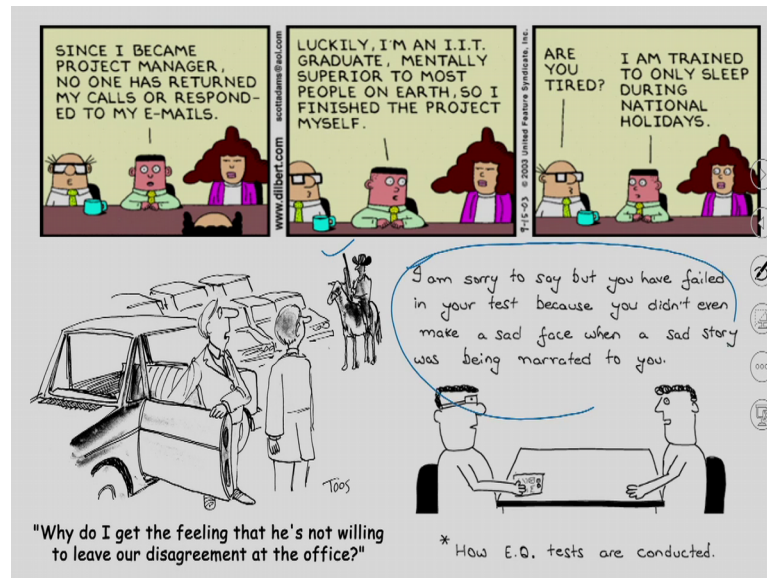
And so some basic things to look at what is emotional intelligence.

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Now as I said I will take a model system which is the emotional intelligence; and basically, Daniel make you understand what is, and how emotional intelligence really work or a standard a model system.

So, Daniel Goleman 1995 in 1988 defines emotional intelligence as: "a cluster of traits or abilities relating to the emotional side of life". So, he says that emotional intelligence is basically an intelligence of how intelligent you are, emotionally. So, intelligence is just

not a academic intelligence rather forms of intelligence also. So, Daniel Goleman came up with the idea of being an emotional intelligent. And it has been found that people are mostly not emotionally intelligent they do stupid things non-rational things; and that is because they are becoming emotional. And, so this concept has been told in that particular way.

And, so he define emotional intelligence this is a cluster of traits or abilities relating to emotional side of life. Now he further states that this kind of intelligence is more important for a happy productive life than IQ. And so, defines there are some major components of emotional intelligence what are they knowing our own emotions. He says that: emotional intelligence depends upon how nicely we know our own emotions. At times we do not know our own emotions we do not know what to do; we do not know what we are feeling.

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And that people are known to be emotionally inferior to the extent that individuals are not aware of their own feelings and they cannot make intelligent choices. So, once you do not know your intelligence you will be not able to make intelligence choices. Since people are not aware of their own emotions, they often low in expressiveness. And so, they cannot express. The second factor is managing our own emotions. The managing our own emotions is to regulate their nature intensity and exposure, can you mange

emotions, if you feel emotionally somebody makes you emotion can you manage your respond; that is another question.

And we will look into emotion in the next section perhaps the next lecture I will describe what is emotion there, and maybe you have better understanding about what we are going at.

Motivating ourselves: so remaining optimistic, enthusiastic and delaying gratification till the final goal.

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Recognizing and influencing others emotions: how good we are at recognize a other peoples in a emotions the ability to read other people's emotions recognizing the mood. And lastly handling relationships: how good we are in interpersonal intelligence, how good we can handle relationship among people our relationship with other people other people, between people across people and so on and so forth.

Evidences on the existence and effects of emotional intelligence: so, there are several evidences which suggests that this kind of a intelligence is there. Now with respect to first these issues the evidences is mixed all other issues have found to have no stable foundations. So, the only factor which actually worked in terms of Daniel Goleman's theory is knowing our own emotions. So, our people able to manage or understand their own emotions and can actually make intelligent choice based on their feeling.

That is the only factor which actually is stable or is the one which is most likely the accepted view of emotional intelligence.

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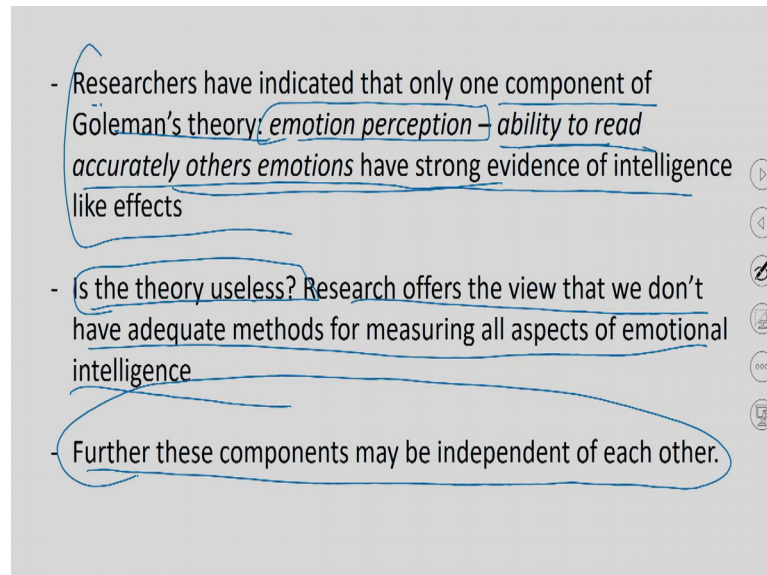
Now as I said there are several factors that he gave on emotional intelligence, but the only factor which is stable or which has been found to be consistent with the idea of emotional intelligence, when it is tested across many people is the idea of knowing your own emotional intelligence So, that is the only factor which is actually survived.

Now researchers have indicated that only one component of Goleman's theory which is emotion perception ability to read accurately others emotions have strong evidence of intelligence like effects. Now researchers in this area, in the area of emotional intelligence or intelligence suggests that most factors which Daniel Goleman has outline has effecting emotional intelligence or a part of a emotional intelligence do not look like intelligence; do not look like a factor of a intelligence. What they suggests is the only factor which probably looks like anything as a intelligent or anything which is close which come closes to the definition of a intelligence is the idea of emotion perception. Whether the ability to read accurately others emotions have strong evidences on intelligence.
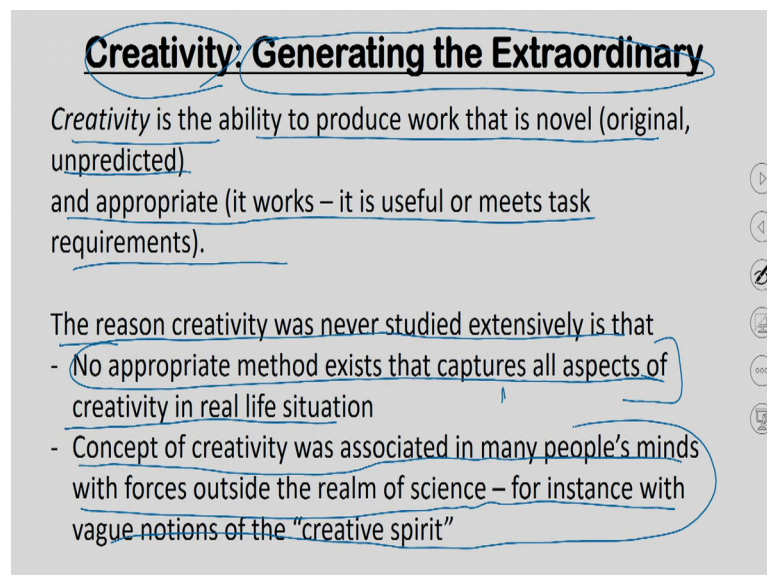
So, how good you are at reading other people's emotion and then behaving accordingly. That is the only factor which has come close to the definition of a intelligence. And so this is the only factor which has been researched upon. If you pick up a book on

emotional intelligence this is the most widely accepted factor, many researches have been done on emotional intelligence, but this the factor which is look forward for.

Now is the theory useless then, because it has mentioned so many factors. Research offers the view that we do not have a adequate methods for measuring all aspects of a emotional intelligence, also further these components may be independent of each other. And so, another one reason is that we do not have the tools and the construct to measure all the concepts that has been defined here in terms of emotional intelligence. And so, that may be one of the reason why we are not able to particularly understanding emotional intelligence the way it has been defined in this theory.

Also, that components of emotional intelligence, they do not high correlation among themselves. Now as we looked at in terms of validity or in terms of reliability if components of a emotional intelligence do not correlate among themselves, they are not a good test which means that all of them are not measuring the same thing. And so, that is the reason; because they have independent of each other that is the reason why this theory is actually not widely accepted or not scientifically accepted because they do not have something called a internal consistency.

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The last section that we are going to do is something called Creativity; generating the extraordinary. So, what is creativity? Creativity is defined as the ability to produce work that is novel original, unpredicted, and appropriate it works and useful to meet task

requirements. So, creativity generally is thought to produce works which are novel, which are different, which is out of the box. But then the scientific definition of creativity does not say that you come up with something, which cannot be defined, which cannot be explained that is not creativity coming up with something interesting is not creativity.

Creativity has two factors into it: one factor is where how do you come up with new product, how do you come up with a new idea and also whether it is workable or not. If the concept that you have come up with if the solution that you have come up with the problem is not usable, is not useful, then it is not creative. So, creativity is coming up with new solutions, but also the fact these new solutions is workable.

When Einstein gave the definition of relativity, it actually could explain so many things which Newton could not explain through his the idea of gravitation. And so, Einstein's idea of the gravitation, Einstein idea of relativity actually explain so many factors which Newton could not. And that is how it was created the solution of creative, because it gave answers to so many explanations. And also, further let do the development of major theories let the development of newer in size; and that is what is creativity.

The reason creativity was never studied extensively. So, why is creativity is not studied, because there is no appropriate method exists that capture all aspects of creativity in real life situations. There is no way to know how creativity is measured. There is no way to actually no appropriate method to define creativity as it has been defined in our world. Some people define creativity as to create spirit, some people will define creativity has something else, or some people define creativity as inborne talent and so on and so forth. So, many people many theories, there is no one cosines on what or there is no one general view among workers among researchers on creativity of what is creativity. So, that is one of the problems which exists.

Concepts of creativity was associated in many people's mind with forces outside the realm of science; for instance, with a vague notion of the creative spirit. And because people believe that creativity is outside the concept of science is outside with the realm of scientific study, they believe that creativity is something which comes from spirit is comes from inner development which comes from inner being, which comes from internal factor something like that.

So, that is why creativity has been not studied till now.

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So, contrasting views of creativity: what produces creativity? Cognitive psychologists focus on the basic processes that underlie creative thoughts, like retrieval of information from memory, association, synthesis, transformation, and categorical reduction. What cognitive psychologists believe is that creativity is dependent on some basic processes. And they have studied these basic processes hence define creativity.

So, anybody who is coming up with the creative solution use something like retrieval of information; how quickly so creative people can come up with multiple ways of accessing memory. That is one thing to look at. Also, association: association between concepts and memory. Creative people have novel concepts association, different concepts can be associated in different ways. So, that is one thing to look at.

Then synthesis creative people can understands not only concepts, but also can transform this concept with tool come up with newer concepts. So, synthesis coming up with new ideas, and transformation and categorical reduction. Transformation of concepts transformation of knowledge and coming up with categorical reduction can deduce information based on categories and come up with newer solutions. So, these were how creativity were defined in terms of cognitive psychologies.

So, studying creativity involves distinguishing between mundane and exceptional creativity. Creativity is two types: one is called mundane creativity. The very idea that take a spoon and from the spoon the liver of the spoon make it a liver and open the tin can jar of a tin can is not actually creativity. So, there are two kinds of creativity: one is called mundane creative which solves your everyday problem coming up with the [FL] as we said that is one form of creativity. The other form of creativity is called the exceptional creativity which actually give solution and novel solution which is not been thought of. And novel solution which works, and novel solution which is out of the box; so no theory exists and a and a way of solving a problem comes in that is called the exceptional creativity.

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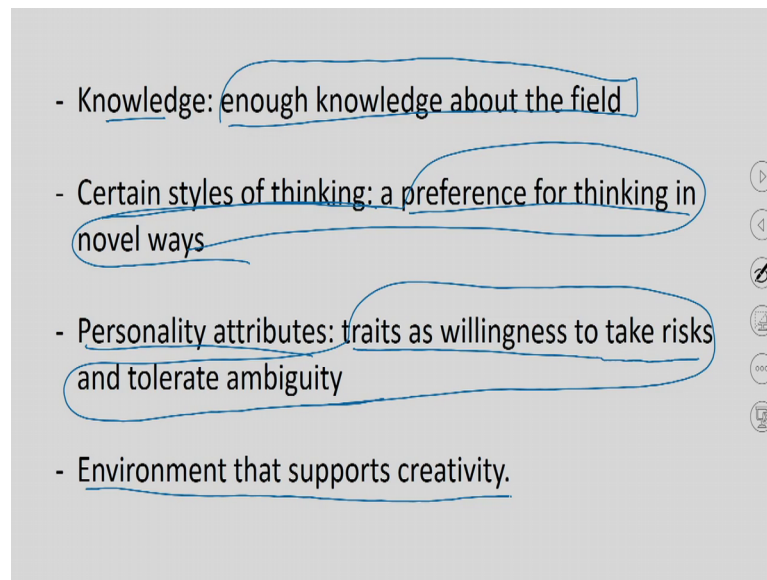

Social psychologists have focused on the personality traits and environmental conditions that encourage creative thinking. So, social psychologists believe that certain personality people, and certain environmental conditions actually a related to creativity or creative solutions.

Confluence approach of creativity: the approach suggests that in order to creative to creativity to occur multiple components must converge. So, creativity for creativity to come up there are several factors which must converge for intellectual ability, the way to see problem in newer ways. So, somebody you somebody can actually see a problem in newer ways in ways which is outside the box will be creative.

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Knowledge: enough knowledge about the field. Somebody who does not has enough knowledge about the field cannot be creative. For example, if Einstein did not give mathematics and physics can we come up with the idea of relativity. So, people who are creative has extensive knowledge about the field that they are studying. Creative styles of thinking: a preference for thinking in newer ways. So, people who are creative you can start thinking of problems in newer ways can tolerate something called absurdities, can tolerate something called uncertainties. And so, they can start thinking in number of ways which not accepted through the present knowledge domain.

And personality attribute traits as willing to take risk can tolerate ambiguity. Now these people are able to take not only take risks with the solution does not work, but also tolerate something called ambiguity. They are fine with the ambiguation solution, they are fine with uncertain situations, they can tolerate this situations and environment that supports creativity. Certain kind of environment for example: enriching environments and environments which gives you some kind of boost are very good with creating creativity.
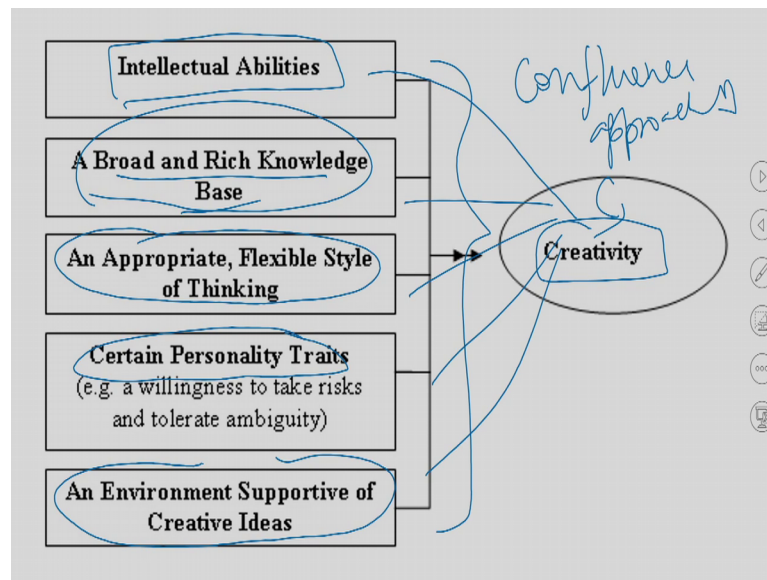
So, creativity has been defined as the concept which is related to these 5 factors. As I have said it is related to intellectual ability how nicely you can come up with problems. Also a broad and rich knowledge based how much do you know that particular area and appropriate flexible time kind of thinking, so you can think in flexible ways. Certain personality types for example, you can take traits can tolerate ambiguity and an environment which supports this. All these together is called the confluence approach of creativity right. So, this is what creativity is all about.

And so, that concludes our section on intelligence in today's lecture. So, quick recap of what we did today. We looked at two parameters of any intelligence tests namely; reliability and validity. And we defined how reliability and validity is actually measured. Then we looked at certain standard tests of intelligence, we looked at the Simon test we looked at the Wechsler test, Binet and Simon test of intelligence, and described how these tests are made what are the constituencies of this tests and so on and so forth. Then we discussed the idea of create intelligence in terms of the cognitive view and in terms of the brain view or the neural view. Then we moved on to defining a model system of intelligence which is emotional intelligence and dealing with it. And lastly, we took up the idea of what is creativity and how is creativity measured or the different parts of creativity, how these parts amalgamate together to form creativity.

And so, creativity in intelligence emotional intelligence and creativity and intelligence go hand to hand together. So, we did not focus too much on to creativity ah, but since creativity goes on with intelligence so we discussed this. The concept on emotional intelligence the idea on emotional intelligence will carry forward from here, because when we meet next, we will be discussing on something called emotional intelligence. So, we will discuss on the context on emotional intelligence. And I will be introducing to you to the concept what is emotion. And from there you can follow up a little bit about what is intelligence.

So, when we meet next, we will be discussing the idea so what is emotions, and a little bit of what is motivation. So, of up till we do that and meet next it is goodbye.