Language, Culture and Cognition: An Introduction

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Module – 01
Introduction
Part 1 cont. & Part 2
Lecture - 02

Welcome back, so we are at the module 1 and part 1 still continuing. So far we have charted the history of the scientific inquiry into human mind starting with the ancient philosophers and up till the modern times. We have seen how the fundamental questions regarding the human mind, the nature of human mind, have remained more or less the same; that is the question of the nature of thought and knowledge and how we acquired them and so on.

The debates surrounding them have also been discussed. Now, continuing with the debate in the post cognitive revolution time, we have we are now faced with symbolic cognition and embodied cognition. We have already seen that symbolic cognition considers cognition, the mental processes, as fundamentally a symbol manipulating system and language is also considered in the same way, that we speak, we are able to utter meaningful sentences and so on, are entirely dependent on symbols that are manipulated by certain kinds of set of logical rules.

Symbols, words are symbols because words stand for something, they do not and they are also arbitrary, they do not necessarily have any meaningful relationship with the object that they signify. So, there is nothing woolly about a sheep, why the word sheep is used for that woolly animal and so on. Now, we move on to the next paradigm in this continuous debate and we come to the critics of the symbolic cognition.

One of the most vocal and most important critics of symbolic cognition with respect to language, language learning to be more precise, has been Searle. John Searle has been very critical of this understanding and the way he approached this question is through his very very famous Chinese room experiment.

So, this is how he went about challenging the basic argument about symbolic nature of language. He challenged the core assumption; core assumption of AI, artificial intelligence, that a symbol manipulating system capable of generating behavior that is similar to human is also having a mind like a human does.

So, if you give some inputs symbols to a computer and it gives out outputs like a human, in terms of language or any other kind of behavioral output; that means, that system has a mind, just like humans have a mind. So, automatically, the implication of such an understanding is that a computer that can pass the Turing test in Chinese or for that matter any other language, understands Chinese.

Because if you give Chinese inputs and you have already put in some system some logical rules into the system that knows how to manipulate Chinese systems, it will give out Chinese output, that are perfect correct and applicable for the real life. Does it mean that the computer or the system knows Chinese? This is what the question Searle posed.

To explain what he was trying to say he imagined himself inside a room in a sitting inside a room that is otherwise closed, has only a window, and through which somebody from outside the room passes him some chits with some Chinese characters in it. The person inside the room, in this case Searle, has all the rules already given to him.

So, all the Chinese symbols and how they should be combined and permutated and so on, what are the logics, what are the rules governing those combinations and so on he already has with him. So, he gets some Chinese inputs and then he manipulates those symbols as per those rules and gives out an output, writes down, writes them down on a piece of paper and he passes it through the window again to the person sitting outside, who judges it to be a perfect answer to the question already put.

This goes on and over a period of time the person inside the room is capable of giving perfectly formulated answers to even very complex Chinese sentences. All he is doing is manipulating some systems, manipulating some symbols that are already given to him. Does it mean that the person understands Chinese? No, the question the answer to this question is a clear *No*, he does not understand Chinese, he is simply manipulating some systems.

So, Searle says if a person sitting inside the room is capable of giving an output that seems to be meaningful still does not understand the language; that means, the computer also does not. Hence, even after successfully manipulating all the Chinese symbols, he still cannot understand Chinese under those conditions.

So, this means that the symbol manipulating system of language probably has some problem, there is a bug in the system, so, to say. Later on may there have been many other scientists there have been many other philosophers and thinkers who have posed similar questions. Another person who really who actually gave it a name simple grounding problem is Stevan Harnad, much later. Of course, there are many more thinkers in between there are many more scholars who had challenged the understanding which we will probably discuss later in detail.

So, symbol grounding problem is again talking about the same issue, that an input-output system of a language probably is not enough to understand how we really learn language or how we really use language in our everyday life. Because if you are learning, if you are connecting one symbol to another purely on the basis of their structure, probability and so on then there is a big problem, because the meaning aspect of the whole thing is absent and this is where the *symbol grounding problem* comes in.

Symbolic cognition view of language is like learning language through a dictionary. So, he famously says that it means 'going from one meaningless symbol to another meaningless symbol'. Because one symbol is grounded into another symbol and not in meaning, not in anything that it refers to in real life or in the world so to say. This symbol grounding problem, this name was made famous by Stevan Harnad.

So, after few decades of in debates in this, we now have what we call another system of on looking at the same cognitive mechanism and it is it has come to be called the embodied cognition. Embodied cognition takes it as a starting point that action in the real life is at the fundamental level of cognition. So, cognition is embodied action rather than mere computation. What do we mean by embodied? It means that an agent moves through and interacts with the environment through a cycle of perception and motion. What does it mean?

An agent means anything any organism whether it is a human or it is a non-human primate or any other animal, that moves into his surroundings or environment and goes

through a cycle of perceptions and of course motion. So, we interact, every organism interacts with its environment and learns and updates it is understanding of the same object through these experiences, through these recurring experiences.

For example, we may learn about the hills, the mountains through pictures through you know in today's world we have Instagram, we have Facebook, and so many things everybody is out there you know telling the world about their experiences; however, small or big. So, we have a plethora of information in front of us.

Now, if we have created an understanding of the hills and the life in the hills from those pictures that is one aspect of understanding. Now imagine yourself really going to the hills, where you have never been before, now once you go there, your interaction with that particular physical environment creates or updates or let say enriches, your understanding, your perception of that your perception of your interaction, your give and take with that environment and thereby your perception about life in the hills changes.

And now this new perception makes you either go ahead with exploring more and more challenging hills more and more challenging treks so on and so forth or you may decide that this is not really your cup of tea and you change your course. So, this is how; this is how a cyclic movement of perception, motion and updating of your already existing information, adding new information and so on and so forth is at the root of your thought process, at the root of your cognition at all times.

Hence this cannot be ignored, hence this is a very very important aspect of human cognition to be taken into account. Now because of this understanding, because of this fundamental understanding that human or other animals, any agent, any organism for that matter, understands or updates that perception through it is physical experiences physical and mental experiences, together. It cannot be without the physical experiences.

Hence you have but the body playing a central role in cognition, body…that is why the term embodiment. So, you understand through your body to a large extent. I can tell I can you know we can write poetry and we can write you know songs and so on and so forth about the beauty of roses. But somebody, who has never smelt a rose, somebody who has never touched a rose, will not really have the adequate understanding of what a rose really means in real life.

So, this is where the embodiment the physical understanding, the physical experiences comes into play. So, you see we are going back, we are going back to Aristotle we are going back to all the experiment all the experientialist thoughts and philosophers who have proposed them; this is basically a cycle.

So, the idea of a pre- given world is rejected in this view, in the symbolic understanding of the in the implicit understanding of the world, the world is as it is, it exists as it is pre given. The role of the human mind is just to reflect it, the role of the language is to take a picture and reflect it in the on the brain and so on and so forth.

In this view, that understanding is entirely rejected; so in this view we take it for granted that the world does not exist as given and as an objective truth; however, the world becomes dependent on the perceiver.

The person who is perceiving the world has a lot to add to the experiences, but does it mean that the world will just go berserk. Everybody will have their own understanding, everybody will have their own subjective notion of the world as to where the sun rises as to where the you know sun sets and how the earth looks and so on and so forth. But we see that is not exactly how this theory actually takes a stand on. This position does not really offer an entirely subjective construal of the world, because in that is simply not tenable.

This theory takes the position that humans share common perceptual and bodily capacity. So, all humans by virtue of being humans, share certain commonalities in terms of both perceptual and bodily capacities, thus there is a shared conception of the world as well. So, there is at one particular level that is universality, at another level, of course there is a kind of a level of relativity that is… that exists.

This is something that we will see throughout this course by giving various examples. Here we are just giving you a very brief introduction to the idea of embodiment as to how it really works in language. So, the idea of a shared biological, psychological and cultural context is very significant in this theory.

Because the biological part of humans are more or less same, the psychological yes similar, culturally there are differences; however, there are still certain universal aspects. So, that is what makes looking at the human experiences, human thought, human

cognition and language very very interesting, because it is never, you know *either/or* ; it is a mixture of various kinds of processes interplaying with each other.

Going to language: forms of experience, social relations, that are characteristically human, will not be possible without language. We know that certain kinds of experiences can cannot just exist without language, words are part of our experiences, we experience scenarios, we experience situations, contexts by using language, language is an integral and very very important part of our experiences.

The world does not come to us as sliced up, as objects and experiences; it is not already given, as we have already seen. There are categories imposed on reality, where language comes in. So, there are categories of experiences that can be seen that is everywhere in the world today, you see certain experiences are considered as heinous crimes in certain cultures, in certain other cultures it is more tolerated and so on and so forth.

So, these things are there is lot of relativity that comes in and language also has a strong role to play in that, language also helps us investigate the structure of experience. Because that is as we will see, as we gradually move into the more specific understanding of each of these cases, we will see how it is not a one way traffic, on the one hand, language helps shape the experiences; similarly the other way round also does take place and it is a coming together of various processes.

So, over a lot of… ,over a many decades in fact, time, cognitive science has changed a lot, starting with, as we have already seen in the already, that 1940 onwards the stage was set for cognitive revolution, late 50's it actually took place and then over a period of this 50/60 years, intervening 50/60 years, this field has changed a lot.

Now, symbolic cognition came to be known famously as a good old fashioned AI. The newer approach is to emphasize real time dynamic relationship between body, brain and the world, that is the embodied understanding of the world. So, this is kind of a newer version of cognition, newer version more accepted and newer version of cognition as it is as it is held today.

The way cognizers, cognizers as in any agent that indulges in the process of understanding and thinking and so on, not necessarily only humans, even non human primates (animal cognition also is a very important field of study) and so on. So, any

cognizer, any agent, exploit bodily and environmental structures to enhance or simplify computational work of the brain.

So, you see embodiment the theory of embodiment does not discard the symbolic cognition entirely, it is still understood that the computation is at the root of the mental processes, probably. There is a lot of, so to say logical rules, but then the embodied experiences help to enhance or simplify those mechanisms.

More recently, a recent more recently a new field of linguistics has taken a lead from these experiences, this kind of scholarly outputs from over a period of time and has come and created a field called *cognitive linguistics*. And this enterprise has delved deeper into this question of concepts and experiences relationship in terms of language, as to how if we look at a language structure in a particular domain and then how we can back-form into the domain of concepts and experiences.

So, this is the first part of our understanding of the historical development in the domain of thought and knowledge and so on. There are some; these are some readings that I have added here, that are all most of them are available online. So, you can that will this text will give you an idea about the development of the field and these are some of the seminal texts or you can say Wittgenstein and others.

Now, after we have given you a brief idea about how cognition happens, what is it, how does it work whether it is symbolic or embodied or a combination of both. we have kind of come to the conclusion that it is probably symbolic cognition is aided by the embodied experiences. Now fine. That was the thought that was the cognition. Now, where does it all happen? So, there is a seat of thought so to say and that is the brain.

Part 2:

So, this part will concentrate on the role of the brain and of course, the history…. advances through history. Advances in neuroscience for cognition, the idea of ecological brain and then the very notion that human brain develops outside the womb to a large extent, the human brain does not develop before birth entirely. So, we will chart the trajectory of studies in this domain in this particular section.

So, the brain is the seat of thought and cognition that is something that we take for granted today. However, this was not the case always; if we go back to the Egyptian times, we will see that mummification, actually the mummification process, actually threw the brain out, whereas they kept the heart intact.

So, brain got its due as an important organ much much later in human history. But anyways, we now kind of we agree that thought process happens in the brain. Research on brain mechanism, so, to say scientific research on brain mechanism, goes back to, in the western world, it goes back to the 17th century to Descartes again.

Descartes will you know come back again and again in our study in this entire course. So, but from the very beginning from the 17th century onwards, we will see when scientific inquiry into the role of brain in terms of cognition, in terms of understanding thought, language and so on and so forth; as soon as the domain took off ,the debates also did take off.

So, the controversies and disagreements and the debates started from the word *go*. So, Descartes was of the opinion that brain has localized areas for separate functions. So, there are various regions in the brain which are responsible for carrying out separate kinds of mechanisms, separate kinds of functions.

He in fact, even located the soul at the pineal gland. His contemporary Juan, what they did not quite agree and he opined that the entire brain works as a unit. So, this you see there are these 2 sides of the debate, this sets the debate, Descartes on the one hand was talking about the modularity, that the brain has specialized, localized functions; on the other hand you have the idea of holism, that is the whole brain works together.

By the 18th century understanding of the nervous system had increased greatly. Of course there are many more important development that happened during the intervening time, there are many scholars who contributed and different kinds of findings that we will discuss later in great detail, when in the brain and language section. But here we are just giving you some important you know points in history.

So, 18th century saw a lot of development in the understanding of nervous system and in the 19th century the debate saw Franz Joseph Gall and Peirre Flourence on opposite sides of the question. In fact, Franz Joseph Gall was very interesting in terms of his

contribution; he created what we call *phrenology*, again following Descartes he talked about specific areas in the brain that are responsible for our various kinds of mental functions.

He had, in fact, a very very detailed understanding of this and because at that time the brain could not be directly looked at, science had not yet developed so much; so, he actually had an understanding of how the structure of the skull could actually tell us about our mental function. So, he had a detailed map of each function located on the skull of the human, human skull and dedicated areas.

As usual there was another person who did not quite agree and Flourence was that person in that time during in the 19th century.

In the modern times of course, now we have more sophisticated tools and the 20th century has seen a lot of developments in this ground and now equipped with a lot of latest technology, sophisticated tools, finding neural substrates of human behavior guided researchers in the till the early part of 20th century.

Now, here we go back again to Karl Lashley; remember we talked about Karl Lashley's contribution to language in terms of you know making it a part of integral part of cognition itself. So, here American neuropsychologist Karl Lashley's brain mechanisms and intelligence a seminal paper a very very a path breaking epoch making paper.

He questioned that the earlier held view of the neuronal localization of specific behavior, that again, that the brain has specialized areas which are responsible and which can actually take care of mental functions individually, alone without any help from other places. At that time Gestalt psychology was prevalent and he was majorly influenced by that understanding, by that theoretical position.

What does this theory say? It posits that we recognize overall pattern first in anything in any given scenario and only after we have seen the whole story, do we really notice the finer points. This is exactly what Lashley also believed in, his he thought that this particular theoretical standpoint can be utilized for understanding neuronal behavior as well. He proposed that the entire brain works as an unit, as one unit as an in an integrated manner; you cannot really pinpoint one specific area for one specific function and so on.

In the Hixon symposium, Warren Mcculloch and Walter Pitts put forward the idea that operations of nerve cells and the connections with other nerve cells can be modeled in terms of logic. Remember we talked about the various symposiums, the Hixon symposium, the MIT conference and the Messy conferences… these were the 3 most prominent conferences that actually brought together scientists in the 1940's and 50's and so on, to actually debate and discuss the nature of human thought and cognition and so on and so forth.

So, it is during that time that this seminal paper was presented by this duo, who proposed that mental functions in terms of the activation of nerve cells, can be understood in terms of logic. See we are going this is in fact in the domain of symbolic cognition that there is some kind of a logical language, there is a sequence of processes that take care of all other all the outputs that we have.

So, the main argument that they put forward was that once a neuron is activated it fires another neuron and so on and so forth. So, that is a logical sequence of neuronal activation, which ultimately gives rise to an output that we see. So, it activation is like a signal that either passes or fails to pass through a circuit.

In this case the circuit basically means the finite neuronal network. So, there is either you either the signal passes through or it does not. So, depending on that, we have a correct or incorrect response and so on or lack of response and so on and so forth. Thus, their work confirmed, in some sense, that the human mind, brain and in brain in this case of course operates via logical principles and hence it is like a computer. So, you see a lot happened in the first part of 20th century.

In terms of the various kinds of theoretical standpoints that scientists and philosophers and others took. By mid 50s by mid 1950s there was adequate research output in support of both sides of the argument. Both sides of the argument as in, the one side was favoring the localization hypothesis, the other side was favoring the unitary cognition hypothesis, that the brain works as a whole.

By the time cognitive science was born that is in the late 1950 there was considerable agreement among scientists that in terms of sensory processing, there was an amount of

specificity. So, there is a particular area in the brain that is called visual cortex, then there is a particular area called motor cortex and then of course you have the auditory cortex and so on and so forth. So, in terms of sensory processing there is an amount of specificity, in terms of localization of the functions; which means there is proof of localization in many cases of processing.

On the other hand, remarkable plasticity is also found… meaning holism might also be tenable. Although it is been found that different brain regions are responsible for different activities, successful completion of any mental function actually needs cooperation, coordination between different brain regions, between different neuronal networks. How do we know that? How do we know that certain functions, in spite of having localized you know areas in the brain, like visual cortex and so on, actually depend on other regions for functioning; how do we know that?

We know these from certain kinds of syndromes that are actually proof of what happens when this coordination does not exist. One of the most important, most well-known probably, syndromes is what we call the imposter syndrome, Capgras syndrome. This syndrome is has been well documented. This talks about a scenario, where one person looks at a close relative, a friend, close friend or a relative or somebody and looks at his or her features and says '*this person looks exactly like my sister, but it is not my sister*.'

In other terms, this the features that the looks the way the person looks is visual that input is visually incorporated into the brain. However, your understanding as to who these set of features actually belong to, is not entirely working properly. So, there is a problem of coordination between the visual system and the amygdala.

So, this collection of features that represents a particular person is what we call identifying. So, a particular person when we look at and we identify this person as a friend, this needs the cooperation between the amygdala, that is your emotional connect to that person, and the visual cortex. So, that is this kind of, this kind of symptoms tell us that it is not enough to just get the visual input.

Similarly, there is another problem, that is another syndrome, that has been found which is called visual agnosia. Where the affected person has only abstract featural input of a scene, but does not *see* anything as a whole. For example, a rose, as ah, Oliver Sacks has famously written in his book, a person suffering from this particular syndrome called

visual agnosia will look at a rose as a convoluted structure which has a straight line attached to it.

So, it sees, the person sees the object as a collection of abstract features, but not as a thing as a. So, they do not really *see* the thing as it is. So, this kind of various problems tell us that it is even though there are dedicated areas for certain sensory inputs, for us to function entirely in a for us for any successful completion of any mental function, we do need cooperation among various domains.

So, which means that localization is not entirely tenable. Thus as we see the history from the speculative claims in the 17th century through lesion-specific brain research in the 19th century to the discrete cell recording in the 20th century, the field has come a really long way. And 17th century Descartes and others had only a speculative idea as to how the brain probably works, that time there was no probing mechanism available.

The 19th century of course, there was a lot of study based on brain lesion… various kinds of disorders and stuff and from there they kind of arrived at conclusions regarding various mental functions. And then of course, now we have the; we have the possibility of even discrete cell recording.

So, years of research in this area after the monumental findings in the 1940's that is you know to the run up of cognitive revolution, this has this entire stage of developments has made Jerome Feldman, we will discuss Jerome Feldman's contribution also in this course later, he declared that thought is '*structured neural activity'*.

So, ultimately, it all boils down to the brain, the neuronal activity and thought is nothing but neuronal activity which has a particular structure. So, now of course that means that thought resides quite literally in the brain.

Now, one important aspect of our understanding of brain is that a lot of information that has helped us understand the localization of cognitive functions has been from various kinds of brain damages. Various types of brain damaged subjects have actually given us a lot of data from them, either due to trauma or disease or epilepsy and so on and so forth. The data collected from normal population, normal healthy population is very recent, the most of the older data actually come from patients, such cases bring to notice the mapping of the type of lesion and the symptoms.

So, if somebody has a speech disorder after a stroke. So, we now we can tell that because of the particular brain region getting affected this is the effect of the same on the language.

So, all these things of course we will discuss in much more detail, with each with many cases with actual cases we will discuss and the research findings and so on. So, let us move on to the relationship between brain and environment. So, we have already successfully established the relationship of thought with the environment, thought with the interaction of the agent and the environment and then the thought and brain and now we move on to look at how brain and environment probably also has a connection.

This is something called that that the somebody has called it *ecological brain,* some researchers call it *ecological brain*. Where does it all come from? Ecological brain primarily means that the human environment, the lived environment, has a role to play in the way the brain develops, the way the brain functions and so on.

This all comes down to the primary fact that humans are the only primates whose brain continues to grow after birth, at fetal rate; this has very serious implications. So, for all other animals for most other animals the brain development has happened in the prenatal period, for humans, the brain continues to grow… a lot of brain development happens after birth. Physical development of the brain goes on till puberty that is the development of the brain, the physical brain.

Beyond this age, beyond puberty, the development is more in terms of mind, that is the software. But the hardware keeps on developing till the time of puberty. Now this makes this they make the environments, the impact of the environment a reality, in terms of brain development. Input from the environment plays a crucial role in case of humans, thus making this a significant issue to address for both cultural anthropologists and cognitive psychologists.

Because the brain is still developing when the human is born and as from birth till puberty is a long time and the brain is still developing while the human is interacting with his or her environment, all that input, all that interaction has a role to play in the way how things shape up.

So, the environment that we refer to in this case is both the natural, that is the physical environment, as well as the cultural environment, that is the people and the social scenario and so on and so forth. While we are talking about the natural environment, we will again go back to the visual cognition. So, in case of visual ability in humans, human visual system is designed for various tasks that we take for granted, but if we just start listing then you see what a lot of activities actually the visual system is capable of doing, in natural cases in normal cases.

So for example, depth perception, back and forth transition between 2D image and 3D representation and binocular vision, you know mental rotation of imagery, coordination between sight, sound and touch and so on, lots of things. For example, once you when you see the kids watching cartoons, the cartoon figures that things that are that keep moving across the screen are all 2D pictures most of the time.

But we have no problem, the visual system has no problem coordinating with our understanding with the rest of the brain to create a 3D image of the scene in our mind, this is something very simple, this is something very basic, that we take for granted in case of visual ability of the humans. However, seeing and perceiving are related, though slightly different, action. So, what we see and what we perceive there is a slight gap, as we will see.

People who are born blind, how do we know this? So, there are data coming from various sources; one of them is this people who are born blind and have got their sight through medical intervention may *see* things immediately. So, once you have got a new pair of eyes you and you open your eyes after the surgery and you immediately *see*.

You see a lot of inputs, you see a lot of objects in front of you and so on. However, to really perceive what they are, what they see, needs an amount of experience. For example, you see a chairs for the first time or table for the first time, or a computer for the first time… you can of course see you see the features you see what it looks like this is this has a black surface and so on.

But then to perceive it in it is totality you need to have some amount of experience with that object, which means you need to interact. So, in terms of coordinating between the object and what it is like from other sensory inputs are also important, in order for us to understand what a chair is like, is not in is not enough to only know the surfaces of a

chair or how you know how, but how many legs it has and so on. It has to the total understanding total perception of a chair to be complete you need to have an all together overall understanding of things.

Similarly, toddlers learn to walk, stand, by training the foot and leg muscles on different types of terrains. So, children, small children when they learn to walk, learn to stand, learn to run across various kinds of surfaces, it needs an amount of training in order to for them to really negotiate different kinds of surfaces. So, even though the feet are capable of know standing, it also needs to understand how to adjust.

These things come with experience and the brain and because this happens when the brain is still developing, these things make a lot of difference. Similarly, if we go to the cultural domain and we see that cross cultural studies have given us a lot of input in this domain. So, we know that even basic aspects of perception are often colored by the way an experience is modeled by a particular socio cultural environment.

For example, a culture that is not familiar with two dimensional representations of real objects, two dimensional art like photograph of real objects might need to learn how to *read* photographs. Read photographs meaning that you should know that this particular 2 dimensional image of people actually refer to what in real life.

Suppose a culture that has no…that does not have this kind of artifacts, this kind of cultural artifacts, this kind of 2 dimensional art form, whether it is photograph or it is painting or whatever of this type, they need to *learn* these things, they need to imbibe those understanding as to what they represent in real life to be able to connect the two.

So, this needs an amount of learning period. So, socio cultural atmosphere also matters, I am sure all of you have watched the film *Gods Must be Crazy,* this gives a very good understanding as to how cultural environment, cultural dimension is very important for understanding basic things in life, understanding what we take for granted as basic in life.

Certain ideas about, let us say idea about money, about possession and so on and so forth can be seriously challenged by certain cultures who have know such artifacts. So, this is where this kind of inputs come very very. become very very important. Similarly, people who are more used to *carpentered environments,* a lot of studies have actually taken

place on carpentered environment, which means that there are straight lines, regular angles and so on, that is the environment that most of us are living in today.

And this is in opposition to the natural environment, natural environment of the physical world, natural world. So, they are they prone to be more of prone to be fooled more by certain kinds of optical illusions, as opposed to people from natural environment. So, which means that people who live in natural environments and who do not have carpentered environments like us, like everything has you know this particular environment here in this room has you know, it's carpentered.

It has the straight lines, it has regular angles and so on and so forth. So, people like us, people who are cultures, who are more used to carpentered environments, are also more prone to be fooled by optical illusions, as opposed to people from natural environment.

So, these kind of findings point out the fact that the brain also depends on the cultural and the natural environment, for its development and for it for functioning. So, overall experience has been found to impact the brain plasticity also, plasticity modulation as well as in the structure of brain, in terms of both physical and cognitive growth; cognitive growth as we just talked, about physical growth as well. We will discuss some studies in this regard later in the course and dependent upon interaction of the agent with the environment, rather than just a as a passive experiencer.

So, once if you are, if the agent is not experiencing anything, if it is not really actively engaging with the environment, it will probably not really work; it works that environment has an impact on the brain's development, its plasticity, it's modulation in terms of cognitive mechanisms and so on. All these happen because we interact, we are active participants within the environment and not just passive onlookers that is how it really works.

So, the environments role in perception was put forward by a very famous in the domain of psychology actually by James Gibson through his idea of *affordances*. This idea already was very popular, the notion of affordance actually has, says the same thing about as we have already seen, just now seen that the role of environment that plays in our brains development.

So, from psychological point of view the that the this particular experience has a name called affordances, this is central to what we call *ecological psychology*. Affordances mean that something like a complementary relationship exists between the human and it's between the animals that is both human and non human animals and their environment.

There is an action possibility that is available in the environment. So, action possibility refers to what? Action possibility for example, a tree has an action possibility with respect to many animals, including humans, it is climb-up-able as he put it.

So, there is a…there is a particular possibility of that particular part in the environment with respect to humans. The affordance is itself is invariant, it does not change, in the sense that it is always there, it does not change with respect to the person, with respect to the perceiver to attend to. So, we may or may not attend to it, we may or may not you know carry out some action with respect to it, but the affordances are always there. So, a tree is climb-up-able whether or not the perceiver chooses to actually climb the tree.

Thus, it does not depend so much on the experience of the perceiver, it is understood in terms of properties of things in the environment, with respect to the perceiver. So, there are certain things in the environment that *affords* certain kinds of action on part of the perceiver. This is the gist of the idea of the affordances as far as ecological psychology goes.

Now, the social life of the brain; culture as we will see as we all know is a collection of practices. So, these are inter-individual. What do we mean by culture? Of course, we are not talking about highbrow culture here. So, we are not talking about complex music or architecture or something; in this particular case we are talking about culture as a set of practices.

Every community has a set of practices in terms of various kinds of events and actions and people, that is what we call culture in this particular context. So, these are inter individual, meaning within a particular community, different individuals interact with each other following a particular set of norms, that is culture, roughly.

It is a collective process,that made of generation of practices, values and related behaviors. So, we have you know value systems that are handed down from generations

and based on those values we have a particular set of behaviors and particular set of practices, so this is what is the totality of cultural practices in a particular given community.

Now, brain is the site that collects these experiences and as a result neural connectivity might get modified through sustained engagement with these practices. Sustained engagement, over a period of really long time over and over recurring behavior through this kind of practices, the brain also gets modulated and modified to certain extent. Thus, cultural models might be directly linked to neural activity. We will see that also in detail later when we talk about the brain's behavior with respect to certain kinds of cultural aspects as we see through language processing and so on and so forth.

So, cultural models also seem to have an impact on the not only on the structure and growth of the brain, but also on the way it actually activates, how the neural activity really happens, how it really takes place in as we are as we process information in the real life.

So, that brings us to the end of this particular segment. We will and in the next segment we will move on we will take this discussion forward and talk about language, we bring language to the forefront now. After we have set the stage for the nature of cognition, nature of thought and how these things are related to the brain and all these things together are also connected to what we call culture, cultural practices, cultural models and so on.

And the last part, part 3 of module 1 we will bring language to the forefront and we will see how language in terms of meaning, meaning generation, meaning communication of meaning and so on, are also connected to, how it is connected to reality, how it is connected to cultural practices and so on. So, that will be the part 3.

Thank you.