The Psychology of Language
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Lecture No 20
Review of Course

Hello friends, welcome back to this lecture number 20, which is the final lecture in the series. Now over the past eight weeks and 19 lectures, we have made a journey starting with understanding what is language and reversing through the various characteristics of language. Looking at it from a psychological viewpoint, and ending the whole series with a debate on bilingualism, which is people who are primed to speak two languages together. Now, frankly speaking, there are very few more monolinguals in the world, people generally are bilingual.

And there is several reasons for it, because English has been pushed as the official language. So, people are bilinguals. And so, we decided the end of it to look at bilingual. The subject matter of today's lecture would be to review all these 19 lectures to understand what we have done in all these 19 lectures and describe in detail a little bit about all the 19 lectures or all the nine units, nine modules that we have covered.
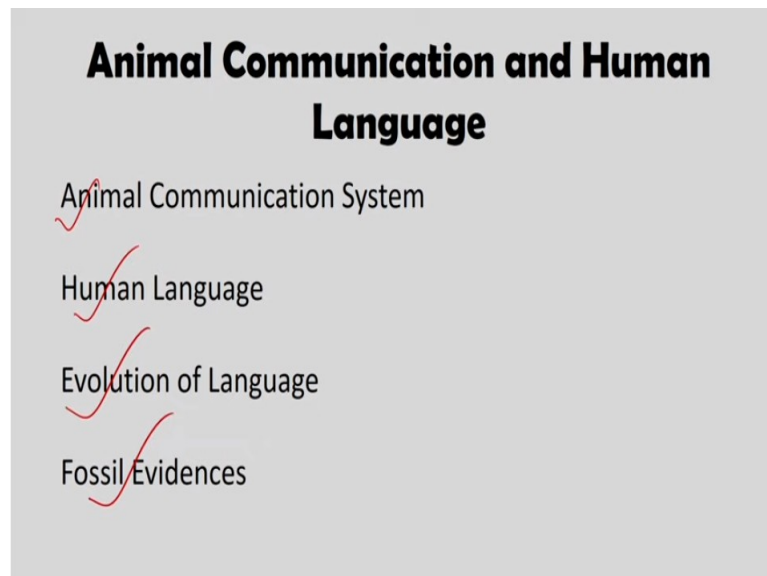
Now, I have been doing reviews all along on all the lectures, but they had been very brief reviews, just to provide you the context of what we have been through. Today's lecture, we will look in detail into each section that has gone into all these nine modules in 19 lectures in total. So, this is a bit different from what we have done in all the past lectures in terms of reviewing the lectures at the beginning of each lecture.

So the question is, why did we start this course at all? What was the need of starting this course and as I explained to you, the need for starting this course, was to look at language and to understand language from a psychological point of view. Now, the question would be why language, obviously, the most interesting fact or the most interesting way of communicating between two people is language.

And so, what I thought was, why not give a shot at understanding language, or introducing language and looking at how language as a cognitive system has developed? So what we will do right now is we will review all those 19 lectures and nine modules one by one and provide

you some details onto what we did in all these lectures. We started on the first lecture by rounding off or trying to understand what is language.

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Animal Communication and Human Language

Animal Communication System

Human Language

Evolution of Language

Fossil Evidences

And is there a more easier way to look at language and we found out that there is and that process is called the communication. So, we started off by looking at what is communication, we went a little bit further than that and needed to understand why do people need to communicate. And the idea is that since more than one people are available, since the world is filled up with numerous people, they need to exchange ideas and they need to exchange thoughts between them.

And the only way that can be done is through language, the language could be a formal language, it could be an informal language, and the easiest form of language is a communication. And communication also have rules like language. So, we started out by looking at the basic communication system. The most primitive form of communication system. And there, we focused on something called the animal communication system, we started off by looking at what an animal communication system looks like.

We looked at why animals communicate and some of the issues that we discuss is that animal communicates for food, for shelter, for the idea of reproduction, for the idea of restraining themselves or warning against predators and so many reasons why animals communicate. We looked at some forms of animal communication system for example, the honeybee waggle or the call of the vervet monkeys, and we saw how these communication systems are designed and what is the purpose of a communication system like this.

We looked at communication system, animal communication system in terms of these characteristics and we found out that the most primitive form of animal communication system or the most primitive form of language, which is the animal communication system, has some basic characteristics. For example, limited range is there, number of ideas that can be exchanged is very limited.

Hollow phrases are used and so not suitable for any situation or most situations, recursion idea is not there, so animal communication systems cannot become mind one after another to mean larger ideas. And animal communication system is always dedicated to right here right now, it cannot tell us about future and past. And so, once we had an idea of what animal communication systems is, we moved on to something called, what is the human language system like.

So, we started focusing on the human language system. And then we saw what are the main characteristics of a human language system. We found out that human languages are generally governed by some kind of rule, although animal communication systems are also governed by rule, but mostly those rules are not defined. In terms of human language systems, the rules are well defined, human language systems have structured components and they use something called arbitrary systems.

So, all these features are features which are different from the animal communication system. Also, animal communication system and human communication system for that matter specifically, the human communication system, has three form of exchanging, three form of exchange. It could be a vocal mode, it could be a manual mode or it could be a visual mode of exchange.

We looked at something called duality of patterning in human communication systems, which basically gives the language its expressive power, what is duality patterning means, taking smaller units combining them to form bigger units. So combining phones into phonemes, and then phonemes into morphemes and so on and so forth. So, basically, this is called the duality of patterning. We also looked at how the human communication system starts with phonemes.

And then goes to morphemes, and then goes to the idea of words, then sentences and then sentences into higher level discourse and pragmatics and so on and so forth. And so, how this system is built up, this pyramid of human language is built up. We also looked at how animal systems make us talk about not only just here and now, but also talk about things which are in the past and well as in the future.

Now, once we had an idea of how the human communication system is, we jumped into looking at a little bit into the evolution of the language systems. And there we looked at how the homo erectus and Neanderthal mans, they developed the language system. We looked at the process of recursion, which is an extending pattern by placing patterns in itself and forming larger patterns.

This is basically recursion and this is one way of explaining how language would have evolved from lower systems. Also, we looked at the discontinuity and continual debate, which explains how language would have evolved and we looked at theories, discontinuity and evidences with discontinuity and continuity theories to prove how language would have evolved from the basic patterns which are there.

For example, the idea of foxpro gene, the idea of pidgins, which basically explains how language evolved either is as a continuity form, or in discontinuity form. Discontinuity form, we looked at the idea of foxpro gene, the idea of disparity between human languages and liberal languages, they say that, the evolution discontinuous of language, whereas the continuity theories, they look at the idea of natural selection and the existence of pidgins, which says the language development is a continuous process.

We also looked at the social learning theories of language and how these theories backup the idea that language would have evolved from basic structures. And lastly, we looked at some fossilized evidences for language. We looked at how pidgins are simplified language and they provide big evidence to the fact that language would have evolved and so evolution of language and fossilized evidence.

We looked at how the language evolved from smaller structures. We looked at how pidgins, most pidgins have some basic characteristics. For example, they have simple phonology, they lack complex morphology, they are limited vocabularies, they do not have syntax, and

they are effortful to produce. We also looked at how teaching of language was difficult and since animals did not have the right apparatus to learn language, and that provide us some idea of how language would have developed.

The simplest form would have developed to the highest form and by looking at brain damaged people, we had some idea of how those fossilized evidences exist, that language would have developed out of evolution.

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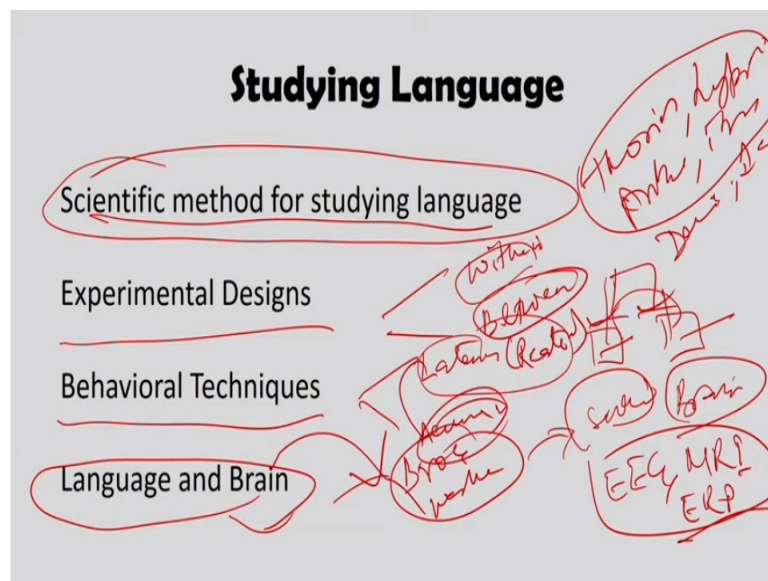
Now, once we had some idea of the nature of language, the obvious second reason was to how to study language and there, in how to study language, we started looking at the scientific method for studying language, we looked at how theories, hypothesizes and things like problems, observations all of them are connected through reductive and inductive reasoning and how this whole research cycle actually flows. We looked at naturalistic observation, the correlational method, the experimental method for doing research.

And that basically gave us an brief understanding of the scientific method for studying language. Next, we looked at experimental designs, we focused on two primary forms of design, we focused on something called the within subject design and between subject design. Now in between subject design, there are two different groups on which the testing is done.

So, if I am looking for some property, some group with a language property and some good without a language property, and so two different people come and do our experiments, this

is called between subject design. If the same subjects are repeated across both the conditions this is called within subjects design. So, we looked at different kind of experimental design, we looked at what an experiment is all about, we looked at the experimental processes, and how an experiment is structured, and the designing of experiments.

We looked at behavioral techniques and behavioral measures in psycho linguistics. And so we focused on two behavioral measures one is called the latency, which is also called reaction time sometimes. And then we looked at something called the accuracy, which is how accurately or how correctly you are able to reproduce something. So we looked at these two measures of language or language experiments.

And lastly, we looked at something called language in the brain. So we looked at various forms of brain related language interfaces. So we looked at the Broca and Wernicke area in the brain, which is dedicated to language. We also looked at several techniques of measuring the brain patterns, while language is produced. And we looked at in some detail into EEG, the MRI, and the ERP as measures of the brain activation when a language is produce.

And so this brought us to a point where we had some understanding of what is language, and how to study language.
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Now, once we had this idea of what is language and how to study language, we obviously needed to make this point clear of how language is produced. Now the very primitive form of language is the spoken language. Of course, we do have reading and writing as language,

but these are newer systems as we will see, in the section of reading and writing. The reading and writing things or language as written form is newer, people did not have this form of language.

Now think about the prehistoric humans, they only used to speak, they used to produce vocalized sentences and they used to speak, they never used to write. Reading and writing came off when people started settling together. So earlier, humans were nomads, and they did not need this reading and writing thing. Of course, they did have some kind of symbols, but that was not a full-fledged language system and so the first form of language or the first the most primitive, the most basic form of language, is the spoken language.

So obviously, we started looking at what spoken language is all about, we started looking at how, I am sorry, so a little bit about auditory perception. This is a repetition slide, so I have to cut it out. So we started looking at how auditory perceptions are there or what does auditory perception really mean. And in auditory perception, we started looking at what is sound, right.

And what does the sound wave comprise of, how the sound is comprised of the frequency and the amplitude. And how this frequency and amplitude, they mark the sound. Because when we talk about spoken language, it is all about sound. So we started looking at the parameters or the characteristics of a sound, and we looked at the two basic characteristics of any sound, which is the idea of frequency and amplitude.

We looked at how this spoken sound, which is kind of a vibrating object, which is kind of a vibration, which comes from the vocal cord, how they have something called the fundamental frequency, and the word tones and so on and so forth. We started looking at how this vibration has or this vibrating sound has something called periodic and aperiodic sounds. We also looked at the organ which is used for perceiving this sound. So if I produce this sound, obviously, you are going to hear this sound.

And this hearing of this sound is basically what is called auditory perception. So we looked at that apparatus, which is able to hear this sound and that is called the human ear. So we looked at how the human ear is designed and we looked at how the cochlea of the human ear, and cochlea in the inner ear, and the basilar membrane, which is in the cochlea, that perceives

the sound.

So how there are hairs which is floating in the cochlea, and the tonotropic organization of the basal membrane, and how this speaks up each tone of sound and interprets them. We looked at how the primary auditory cortex is located and how they have connection to the basilar. And we also looked at the fact that we cannot just recognize things or objects by just the sound of it. So in auditory perception, we looked at the properties of the sound and the properties of how the sound is composed of.

The next thing that we looked at is called the speech system. We looked at how, so as I said, this is from the earlier slide, so we're just cutting it off, I am just putting new things into it, so next, we focused on something called the speech system. And so, what is the speech system, in the speech system we looked at what is a spectrogram and what does a spectrogram depict. So, spectrogram is basically a measure of the spoken sound that we produce and it is in a display form.

Now, we looked at how prosody, which is the perceived modulation of speaker's fundamental frequency, how it is produced and what meaning does it has in auditory perception. We looked at how vowels and consonants are defined in terms of formants and Soren's. The transition between formants and Soren's, so this is the formant, this is the transition, this is the speech sound or this is the display of the speech or the extent of speech sound that side.

We looked at how speech is continuous in nature and they do not, the speech sound does not, is not discrete, but it is continuous in nature. We looked at how speech perception system relies on context to fill up missing sound. So, we looked at how speech is dependent on context. And so, what we speak and what is perceived, they differ by the context. So, what you speak is placed into a particular context and this makes you understand what a speech is saying.

And we also looked at how the McGurk effect states that not only vocal speech, but body movements integrate with each other to basically produce speech or to basically perceive speech. The next thing that we were looking at, is looking at the development of speech perception. How speech perception is developed in children, so development of speech

perception in children. We looked at how fetuses in the third trimester itself can hear, we looked at how infant directed speech, which has higher fundamental frequency and broader ranges.

These are used for teaching small infants to perceive speech. We looked at how prosodic bootstrapping is used by influence to cut out parts of speech or to dissipate parts of speech in terms of words and morphemes and phonemes and that kind of thing. So basically, prosodic bootstrapping hypothesis proposes that infant use the intonations and stress patterns to infer the phrase and word bondage, they understand where the word ends, and the next word starts.

We also looked at something called metrical segment, which is that how the onset of a stress syllable that explains the start of a new word. We also looked at how transitional probabilities help in infants in understanding word boundaries and phrase boundaries. And, we also looked at how infants are born with this ability to develop or understand speech. Lastly, we focused on something called theories of speech perception.

So, we looked at three different theories of speech perception. We looked at something called motor theory, we looked at something called the general auditory framework and we looked at something called the direct realism theory. So, what is the motor theory? Now theories of speech perception was proposed to explain the lack of invariance problem, which is the fact that what you speak and what is heard are two different things.

So, what does the motor theory say, motor theory says that the lack of invariance problem is taken care by the fact that the acoustic signal is not the meaning of any speech, but the vocal gesture, which is produced by producing speech is the intended meaning of any speech. And so, they take care of this invariance problem by that. So, what is speak is not important, what vocal gestures are produced is more important is what they believe.

The general auditory framework, they believe that speech perception overcomes the lack of invariance by suggesting that we make use of contextual cues, including information from other senses. So, they say that cues from the context in which we are perceiving the speech and input from other senses like the eyes or body language, they help us in producing speech or perceiving speech.

And the last is the idea of direct realism. It is based on the discovery of mirror neurons, which are active when both performing and perceiving a speech. And it says that, by just looking at a speech act in progress, we can perceive speech. So that is what we looked at, in the section on speech perception.

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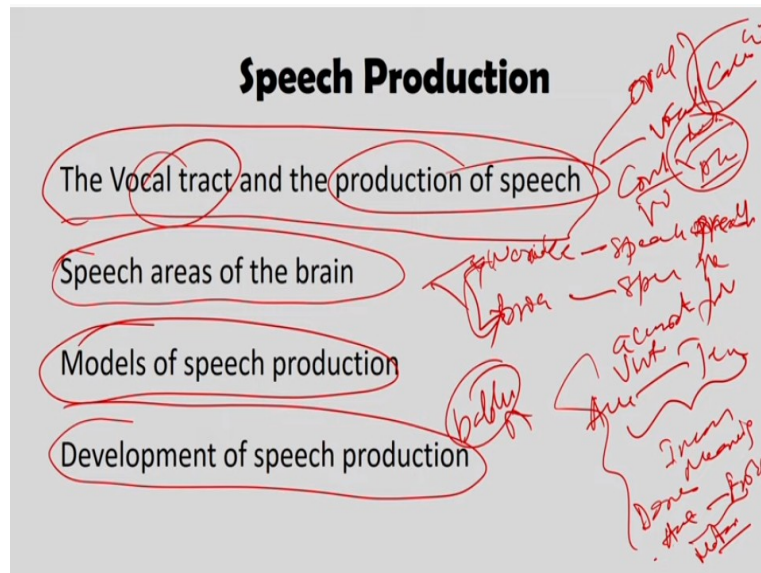
Now, once we had an idea of how speech is produced, speech is perceived, how somebody hears speech and makes meaning out of speech, the spoken language, the next obvious thing was to look at how speech is produced for that matter. What is the way in which speech production happens. And so we dwell into the idea of speech production and we started by looking at the idea of the vocal tract in the production of speech. So how is the vocal track made, and how is the production of speech happens.

We looked at the oral and vocal cavities, how these oral and vocal cavities helps in producing speech and looking at the resonating chambers, the vocal tract, the resonating box, how all of these combine together to produce the speech, which is there. We looked at how consonants and vowels are produced, particularly in consonants we looked at the manner of articulation, and the place of articulation, how this leads to production of consonants.

Obviously, the difference between consonants and vowels are vowels are produced without obstructing the speech stream, which basically means that the vibrating resonance, which is coming from vocal track, this is not obstructed in any manner, whereas consonants is produced by obstructing this vocal track. So we looked at different type of consonants, we looked at how three determining factors are responsible or play a role in producing

consonants.

For example, the place of articulation, the manner of articulation, and voicing. In the place of articulation for producing consonants, we looked in detail into the lips, the teeth, the **(())** **(22:27)** ridge, the hard palate and the velum and how and how they produce different kinds of consonants. In the manner of articulation, we looked at things like complete stop, construction and diversion of the airstream as a manner of articulation, and how they produce the consonants.

In terms of vowel, as I said, vowels are produced by not obstructing the speech stream, so the speech or the vibration, which is coming from the vocal track, they are not obstructed in any manner. So we looked at how, by modifying the shape of the oral cavity, the factors of the height of the jaw, the position of the tongue, and the shape of the lip, they produce the vowel. So jaw, teeth and the tongue, they interact together to produce the different vowels that we have.

We also looked at what is a diphthongs and we also looked at how diphthongs are combinations of vowels, but they sound like a single vowel. So, in detail, we looked at how consonants and vowels are produced and what are the ways of producing consonants and vowels. And we also, in detail, looked at, how speech is produced for that matter. Next, we looked at speech areas in the brain, the different kinds of speech areas in the brain and there we focused in detail with something called the Wernicke and Geschwind model.

And we looked at how Wernicke and Geschwind model says that the Wernicke area is responsible for speech production. So, they says that Wernicke area is responsible for speech production and the Broca area is mainly for, sorry the Wernicke is for speech perception and Broca is for speech production. And these Wernicke and Broca area are connected by something called the arcuate fasciculus, which is a fiber which is connecting between these two speech streams.

So, speech area in the brain, generally the Wernicke and Broca area and how they are, what functions they have, and how they are connected with each other. Now, the Wernicke Geschwind model explains why different kinds of dyslexia can aphasia can occur in speech stream. We also looked at other cerebral areas or cerebral cortex areas, which is responsible

for producing speech.

And we looked in particularly some areas like the basal ganglia and the cerebellum, which is important not only in speech production, but also in motor production. So, that is what we did in this particular section, where we looking at the different speech areas in the brain. Next, we looked at different models of speech production, what are the different models, which define how speeches produced.

And current models of speech production are built on the findings on neuroimaging studies. So, we looked at some of the neuroimaging studies and we looked at how different models are there. We looked at how speech production, they recruit many areas in the brain involved in moving the limbs, the motor system and into the feedback and feed forward system. We also looked at some job perturbation studies and auditory perturbation studies that somatosensory feedback is also necessary for speech production.

So not only the feedback and feedforward and looking at the motor system can tell you speak production, but the production is also taking input from somatosensory feedback. Now, there is a feedforward model, which propose that motor systems in addition to generating the motor plan generates expected sensory consequence of that motor plan. So, feedforward model says that the motor area, they produce the motor plan and they generate this sensory feedback also.

There is something called the dual stream model of language processing, that proposes a ventral stream for the auditory cortex to the temporal lobe interprets the meaning of the incoming speech. So, temporal lobe, so, from auditory cortex to temporal lobe, it interprets the meaning of the incoming speech and then, there is a dorsal stream, so, this is called the ventral stream and there is a dorsal stream from the auditory cortex to the frontal lobe, it links the motor programs.

So, it monitors the motor programs or provides somatosensory feedback to the speech stream. So, we looked at that particular kind of thing. So, the dual process model. And lastly, we looked at something called the diva model, which is a computational model and it incorporates the latest, comes from the latest neuroimaging data. It conceptualizes, so basically, the diva model focuses on the Broca area and what it says is the Broca area has a speech sound map linking system.

So it says that the perception and production of speech is done both by the Broca area. It also accounts for infant speech production and adult speech production and what the diva model says that it happens through the same system. And lastly, we looked at how development of speech production happened in children. So we looked that in the first six months, infants produced varieties of speech like sounds with the onset of canonical babbling, and the child begins to produce clearly perceived consonant vowel.

So we looked at how development happens. So the first thing was looking at babbling and the stages of babbling and how babbling leads to production of speech. We then looked at something called the frames and content model theory, which explains babbling in terms of repeated jaw movements, and how this frame and content model leads to the idea that speech production or speech is, how the infants develop speech.

We looked at how caregivers imitate the babies babbling, and this social feedback helps the infant refine their idea of speech production. We also looked at how delays in babbling can lead to lower levels of speech production or slower speech production in infants and that is where we ended this section on speech production.

So, by this time, by the time we had completed the four lectures, we had an idea of what is language, we had an idea of how research is done in language, and we also had an idea of how speech is not only perceived, but it is produced. So, of course, we had some details about the idea of language or the idea of speech production and speech perception and a little bit of the history of language. We shifted gears here and moved on to the idea of words.

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Now, most spoken speech or written speech, they composed of words, and so word is the interface between either spoken language, so it is a way station I would say, spoken language, written language or any other form of language which is there. So, words are the central part because words are what is exchanged, when we speak we exchanged words. So, obvious question was looking at words. And so, we started off by looking at the anatomy of words, what are words like.

We looked at how words are minimal units of meaningful speech, that can be produced in isolation. So, this is meaningful speech and this is how the minimal, this is the minimal unit of meaningful speech. We also looked at how words have dual nature, phonological nature which is the pronunciation of it and semantic nature or semantic representation, which is the meaning. So, the phonetic nature is the pronunciation of a word and the semantic nature is the meaning. For example, look at the word dog.

Now, the pronunciation is D O G and the semantic nature is the four legged animal, which is basically man's best friend, barks and so on and so forth. So, how words have these two dual natures. We looked at the content, the different types of words which are there, we looked at how content words and functional words are there and we looked at how content word. They convey bulk of the meaning in the word, and how the functional word are just used for syntax.

So content words are words like dog, hat, cat, rat, something like that, and functional words are the words which combine these, these are useful syntactic structures for example is, the,

of, on, over, these are content words. So how they are words, which provide structure to sentences, and how content words actually mean everything in this world. We also looked at how words, they shape their, they change their shape, according to the morphology.

So, depending on the context of the word, they shape their meaning. We also looked at how the word spoken in isolation consist of phonemes grouped together into one or more syllables, and how they help us in defining boundaries. We also looked at something called as symbol grounding problem, which is basically the problem which suggests that how do words attain the symbolic meaning that they have.

And so there we looked at the idea of cognitive approach and some different approaches, which basically suggests that how words attain the meaning that they have. Now once we had a little bit of idea of the anatomy of a word, we moved into the idea of how words are learned. And there we looked at vocabulary acquisition, through the lifespan, they follow S-shape, and we looked at how children initially they learn slowly, but then there is a period from eight weeks to four weeks, I think, two years to six years where the spurt is very high.

They learn a lot of words and then it decreases down. Now, we looked at how word learning happens, we looked at how word learning is a three part process, it starts with constructing a concept, learning the phonological form of it and creating this concept and making a link. So, word learning starts by learning this concept of dog, then learning the pronunciation of dog, so this concept of dog and the pronunciation of dog and then linking them together.

We also looked at how some words are learned very quickly by children through fast mapping and some words takes time for learning. We also looked at the challenge for word learning from referential uncertainty or knowing what aspects of current situation novel word refers to. We looked at the idea of referential ambiguity and how this referential ambiguity has to do with learning of words.

And lastly, we looked at various characteristics of word forms such as word frequency, neighborhood density and so on and so forth. They combined together to have passing learning a word. Once we had some idea of how words are learned, we moved on to looking at how words are generally stored. So what is the way in which different words are stored, we looked at how words are stored permanently into long term memory and mental lexicon.

And in terms of the pronunciation and the meaning. We looked at how the mental lexicon only stores the lemma form for word, which is the basic form of the word and how this lemma form, then regenerates other forms of the word. We looked at how the mental lexicon is arranged, in terms of network of words, and the two basic forms of arrangement. The taxonomic arrangement and the thematic arrangement, that is how the words are stored into the mental lexicon.

And we found that this the taxonomic and the categorical arrangement, how various studies, experimental studies in terms of the word assertion test, the semantic priming test, they provide evidences that this kind of format of storing is there. And lastly, we looked at how words are retrieved. So, basically, how words are retrieved from long term memory, we looked at how word recognition, it involves extracting phonological form from the speech stream.

So first, the phonological form is retrieved from the speech stream and then, by way of linking them to the mental lexicon, the meaning of the word is retrieved. Now, the spoken word recognition has three process, it is a three process thing. The first the lexical access is there, the acoustic signal is matched to his candidate, then the lexical excess is there, in which the best candidate based upon the context of expectation is there and the third is the lexical integration, where the symbol, the linking of the word with its meaning is happening.

So how words are retrieved. We looked at the cohort model of word recognition and what it proposes that a cohort of candidate is generated and from that the best candidate, or the best word is taken. We looked at models of what production has two general features or two stages the lexical state and the phonological encoding stage. We looked at the feedforward model of word production and the Dell interactive model.

In the feed forward model, we looked at how information flows in one direction from one lexical selection to phonological selection and in addition to this, which says that there is also a feedback chain to it. And then we also looked at the Dell interactive model, which says that there are three layers of semantic word and phoenemic and how spreading activation connects them together.

So that is what we looked at in terms of the model of word production and all about word in terms of its learning, in terms of its storage, and in terms of its retrieval.

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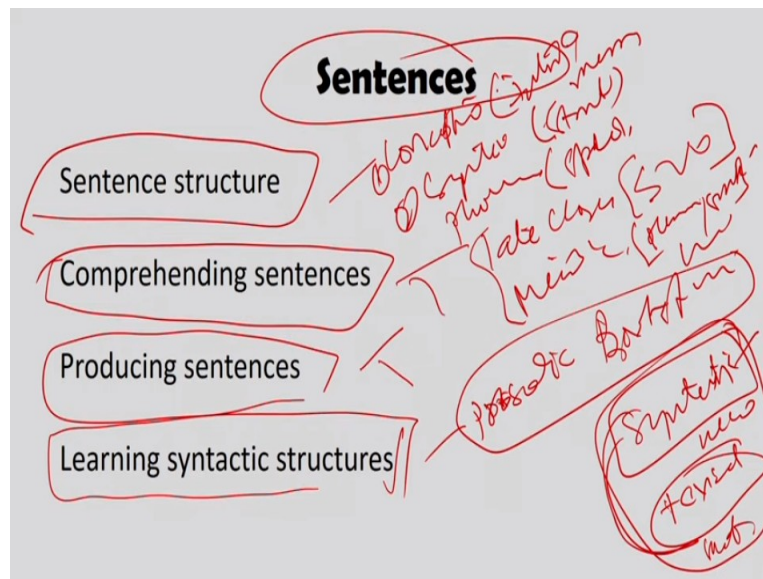
Now, words are not the only thing because when we talk we generally do not use just words. We take these words and we put it into longer sentences. So next obvious thing was to look at what are sentences and some properties of sentences. So, we started looking at what are sentences and we started that by looking at sentence structure.

So, we looked at the sentence processing, how does it happen, it happens first at the conceptual level, which is the intended message then at the syntactic level, which is the structure of a sentence, and the third is in the phonological level, which is the spoken sentence. So, any sentence processing helps in this way. Now, at the conceptual level, what happens is, sentences are description of events, and the nature of event determines that type of the participants, the thematic role and so on and so forth.

At the syntactic level, the basic components of sentences are the subject, verb, object, clauses and so on and so forth. And at the phonological level, the spoken form of the sentence is produced, it entails programs for syllabication, the assignment of stresses, the intonation and so on, so forth. We also looked at how noun phrase and verb phrase are there. How noun phrase consists of a noun plus any determiners and a verb phrase consists of a main verb plus any auxiliary verb related to it.

We also looked, what a clause is, in terms of a simple sentence consisting of verb and its

arguments. Then, once we had some idea of how sentence structures are there, we started looking at how sentence comprehension happens. How do we comprehend sentences? And in this, we looked at models of sentence comprehension, and we looked at how these models of sentences comprehension can be divided into two stage model and the one stage model.

In the two stage model, the syntactic analysis and the semantic interpretation happens at two different stages and in the one stage model, the syntactic interpretation and the semantic interpretation happen at the same stage. We looked at how heurist help us in comprehending sentences.

And two main kind of heurist that we that we looked at a something called a late closure, which says that the subject verb object is the format of any English language and the minimal attachment heurist here is these are the two years which are used in sentence comprehension. So what is the minimal attachment? It says that the phrases are organizers according to the simplest possible structure, so the simplest possible structure is used in terms of arranging the phrases.

So how these two kind of heurist are used in comprehending sentences. We also looked at how many sentence sentences are structurally ambiguous, but syntactic priming can bias the listener towards one particular form of the sentence. So that is how we looked at or that is what we looked at in terms of comprehending sentences. Of course, we also looked at a little bit into the electrophysiology of it and the ERPs, but I am not discussing that here, so if you can refer back to the lecture in and look at it.

So this is the review lecture so we will be keeping things at the minimal level. We looked at how producing sentences happens, how sentences are produced, and we looked at how, as we produce sentences, the information flows in two dimensions, the vertical dimension represents the processing of individual words, from conceptual activation to lexical excess to phonological encoding and the horizontal refers to link process of producing words and phrases in the right sequence.

So the horizontal is looking at word and sequencing in a manner and in the vertical, in the vertical dimension, it is words to the conceptual activation to the lexical excess, and so on and so forth. How these two dimensions are out there. We looked at how centers for

production is incremental in nature. So when we when we plan a sentence, we do not plan the sentences ahead, we say something and based on the feedback, we keep on increasing the sentence. We also looked at scope of planning in a sentence and how this scope provides evidences to sentence producing efforts.

And we looked at the inconsistency of scope of planning data, in terms of experimental procedure, and how they bias participants, two words one scope also planning scope may be varying according to the processing demand, and also how different levels of processing may have different scores for producing a sentences. And lastly, we were interested in looking at the syntactic structures, how learning of syntactic structures actually happen. We looked at how infants use the prosodic patterns, prosody is the intonation, the ups and downs.

The way speech is broken, how infants use these prosodic patterns to group words into phrases in a process called the prosodic bootstrapping. So by looking at the ups and downs in the speech, how infants use this in finding out the structure of a sentence. So how this prosodic thing is used. Also vocabulary and syntax develops in parallel during the earlier year. So we understood that this syntax development and vocabulary development happens at the same time, and they reinforce each other in children.

Now children use syntactic bootstrapping to inferred meanings, so children use syntactic bootstrapping, which is basically understanding the sentence for learning new words, and they use the lexical bootstrapping for understanding new structure. So how children use the syntactic and the lexical bootstrapping for understanding new words and new structures.

We looked at the generative approach, which argues that language acquisition is driven by innate language specific abilities and we also looked at the uses based approach framework, which says that children use cognitive mechanisms to gradually understand the grammar of a particular word. We looked at how specific language impairment involves in the deficit on the use of certain grammatical morphemes and what they suggest in terms of learning syntactic structures in children.

And lastly, we looked at how recent neuroimaging studies show that language processing is a bilateral in infancy, but gradually lateralizes to left hemisphere by the early school year. So basically we looked at how this language, syntactic structures of sentences are learned by

smaller children.

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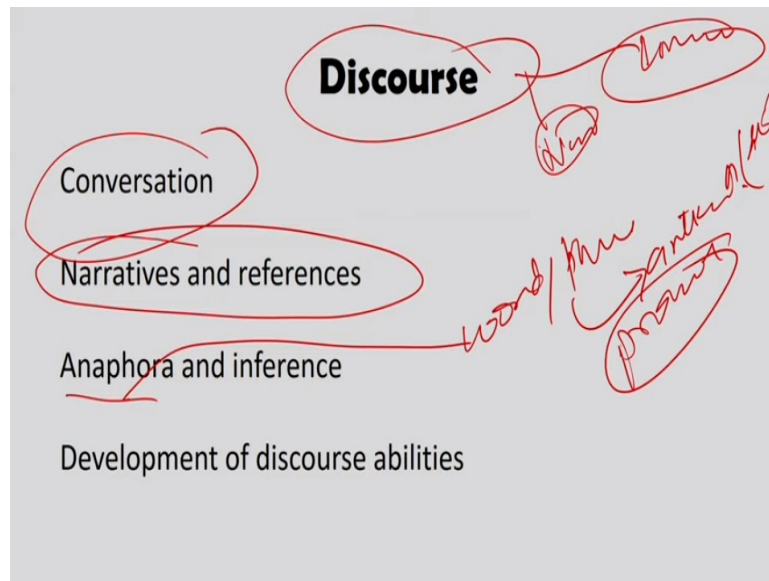
So once we had an idea of what a language is and we had an idea of what words are and we had an idea of what sentences are, and how sentences are used for exchanging words, obviously sentences do not mean everything. Once we produce a sentence and the next sentence comes in, and this is what a discourse is. And so next thing that we were interested in looking at what are discourses. So we started looking at the idea of a discourse, we started with looking at conversation.

So first of all, we started looking at what is discourse by the way, and so discourse is a set of sentences that cohere about one or more related topics. So it is basically sentences produced, for and against or two people producing sentences onto a related topic. Conversation is the most basic form of a discourse and it has an edit feature of being a collaborative process between two or more participants, who take turn. So conversation is when people exchange words or sentences between each other and they take turn in doing so.

Conversation is replete with ill form sentences and they are vague references, conversation patterns underlie each other, because they have recourse to pragmatics. Also participants in a conversation, they take turns, so when in a conversation, somebody speaks and somebody else speaks and that is how conversation progresses. Also, the listeners play an active role in conversation, but providing the speaker with a black channel by indicate points of understanding.

So, listeners in a conversation they produce some kind of feedback, which gives the speaker some kind of a back channel that the conversation should progress. We also looked at how to turn allocation is decided in a conversation in terms of the current speaker selecting the next speaker or in terms of listeners self-selecting themselves as the next speaker or the current speaker self-selects through the process of cycle of two and three and so, how this turn allocation happens.

Finally, we focused on the participant in conversation tend to match each other in terms of body movements, breathing rate and so on and so forth, so how they are in sync. Not only in terms of the conversational structure, but in terms of the body movement, the heart rates, the speech stream and everything, how the, in a conversation how people are in sync. The next thing obviously, was looking at narratives, which is another form of conversation.

So we looked at what our narratives. Now conversations and narratives form two end of a discourse. So discourse has two parts, we have something called conversation where everybody speaks and a narrative when one person speak and the other listens to him. Now in case of conversation, the interlocutor take turns in constructing a discourse, so most people speak in a conversation and in a narrative one interlocutor dominates as a narrator, although listeners still play an important role.

So when somebody speaks and the other person looks at it. So we were looking at what are narratives. We looked at how storytelling, which is a form of narrative, is cognitively demanding, because the speaker and the listener need to distance themselves away from here and now. They have to go into the reference of the story. Also, we looked at how story grammars they provide the framework for narratives, a story consists of one or more episode, they depend on the construction and comprehension of the schemas.

Next, we focus on something called references, which is the process of using a word or phrase to represent an entity, speakers need to judge what is in common or privilege ground and what crafting referring expressions are used. We looked at the relevance theory, which proposes that speakers try to strike a balance between too much and too little information in selecting refereeing expression.

So how this referring expression has some role to play in narratives and we also looked at

how interlocutors collaborate to hone referring expressions and how clinical studies provide evidences to such kind of effect. The next we focused on something called anaphora and how and anaphora and inferences are related together. So, what is an anaphora? Anaphora is a word or phrase that refers back to an antecedent in a discourse.

So, this is a word or a phrase which refers back to an antecedent in a discourse, and so, basically, the pronoun is a good example of anaphora. Now, anaphoras are memory retrieval crew and the proper use of anaphora, they considerably ease as the listeners comprehension of any discourse. We looked at different types of anaphora that speakers choose depends on the part of the antecedents, which is given to them.

We looked at the cohesion theory, which says that cohesion refers to the use of linguistic devices such as anaphora to build sentences in a discourse, so how cohesion uses anaphora to form a discourse. We looked at the speech act theory, which proposes that the value of an uttering should be judged not by it literal meaning which is the location, but rather by the intention of the speaker, which is the illocution.

So, what a person says is not the meaning of it, or speech act or a speech, but what is the intention of the speaker should also be taken care of and the effect that it has on the listener, the pre-location, the pre-location. So, the pre-location, the illocution, and the location, all combined together to give meaning to a speech. We also looked at an indirect speech act, is an utterance whose literal and intended meaning are different. Indirect speech acts are often used to express politeness.

So, how indirect speech acts are also used as a form of inferences, as form of discourse and lastly, we looked at the Grasim's cooperative principle and how they guideline the idea of speech. And lastly, we focused on something called the development of discourse ability. So, how development of discourse ability happens, we looked at how turn taking behavior of conversation is learning infancy during face to face interaction by the caregiver.

We looked at how some small children with developmental language delay, eventually catch up with peers and so what happens after that. We also looked at two types of co-speech gestures, which are index gesture and the iconic gesture and what do they mean in terms of development of discourse ability. We also looked at how children are sensitive to emotional

contents or the prosody when hearing in isolation and how they tend to ignore when it conflicts with the semantic of the utterances.

We looked at the Gricean maxim sometimes leads for the adult to make inferences not in a logical way, and finally, looked at certain kind of language deficits and what they tell us about the development of discourse ability. Now, once we had some meaning of what is a discourse or how spoken languages are treated, because up till now we have only been dealing with spoken languages, we jumped on to understanding the written and reading and writing, the written form of languages. So how does reading and writing come up?

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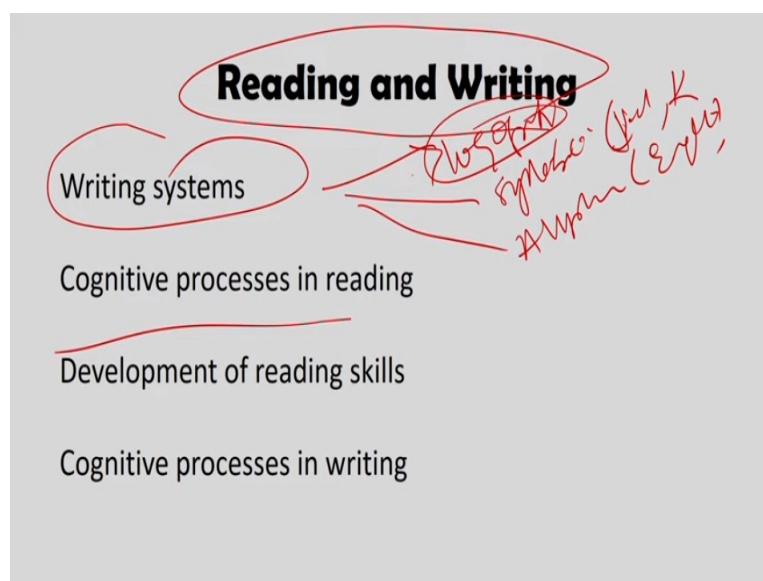
We looked at that how the brain was never dedicated to writing and they have specific, the brain does have specific dedicated area for speech production, but it has no area for reading and writing. We also looked at how there are three different writing systems in the world, we have something called the logographic, which is the Chinese form, we have something called the syllabary system, which is like the Japanese and the Korean form, and we have the alphabet, which is the English form.

So the logographic system, it uses symbols to represent words or morphemes, the syllabaries represent each possible syllable of a language with a different symbol. And the alphabets represent language at the phoneme level, at the sound level. Now, we also looked at what is an orthography, which is a set of rule for writing the words of a different language, we looked at how we can have different languages with a shallow orthography, for example, Spanish and a deep orthography, for example, English.

We looked at what are homophones and what are homographs. We also looked at the visual word form area, which is the region at the boundary between the inferior temporal lobe and the parietal lobe and how they help us in understanding the different shapes while writing a language. The observation that all writing systems are processed by the same way in the brain is explained in terms of the neuronal recycling hypothesis, which proposes the brain area designed for one function can be recruited to perform somewhat similar function.

And so, how this neuronal recycling hypothesis suggests that writing systems or newer systems, writing or reading system are the newer system, and they make use of certain brain area, which was dedicated for some other purpose. Next, we looked at the cognitive processes in reading. So, what are the various cognitive processes reading, we looked at how the eye movements, they explained reading and reading can be explained in terms of the saccades and fixations and how skill readers read.

We looked at the visual acuity, what is visual acuity and we defined visual acuity is limited to a small region of the retina behind the pupil known as the fovea, the area around the fovea, known as the para-fovea also provides the blurred image. We also looked at the range of letters that can be taken in during one fixation of the eye is known as the perceptual span, so we defined what is perceptual span.

Actually, reading is about moving from word to word and there are two process one is called fixation, the other is called saccade, fixation is where you are fixating on a particular word, and saccade is when you are jumping around words. Now, we looked at how fixation duration is influenced by the characteristic of the currently fixated word, such as frequency and predictability.

We also looked at how the dual route model proposes that lexical excesses in reading can occur through a direct route linking the written word to its meaning or else through a indirect route in which the words phonology is first accessed. So that there is a direct route of linking a word to the lexical excess through meaning and there is an indirect route where, the first the pronunciation is taken care of, and then the meaning is linked.

And lastly, we, we also looked at how the inner voice is there when we actually read and how

this inner voice helps us in reading, what is the meaning of this inner voice. We looked at how the development of reading skills happens and there we looked at reading skill involves not only quickly accessing the meaning and pronunciation of the visual word form, but also includes the ability to move quickly through a text when maintaining good comprehension.

We also looked at how reading skills are normally distributed among the population. We looked at developmental dyslexia as a reading disability in children and how they provide some evidences to development of reading skills. We looked at phonological awareness or sensitivity to the sound structure, or the word essential prerequisite to learning. And we looked at some brain studies, which give us some idea on the development of reading skills in children.

And lastly, we focused on something called the cognitive process in writing. So we started looking at how learning to write the letters of a writing system involves changes in two areas of the brain, which is the visual word form area, the occipital temporal juncture of the brain, and and the Exner area, which is in the frontal lobe, and motor plans for handwriting. So, how the symbol is produced in the occipital area and how it is linked to the Exner area, which provides the motor access for handwriting.

Learning to spell requires integration of three types of information, we looked at the phonological structure of what the orthographic rule for converting spoken words into written form and the morphological information about how word forms can change. So, these three things are necessary for producing spellings. We looked at the Hayes model as a theory of cognitive processes, which is involved in the writing task and guided writing research more than three decades.

So, how the Hayes theory is out there explaining the cognitive process of writing. We also looked at how visuospatial areas or the text are important to skilled writers, who organizes paragraphs based on how they laid out on the page and use of spatial memory and location of spatial memory for writing. So, up till this point, we had a lot of understanding about what is language, the psychology behind language, and the various functions of language or the various features of language.

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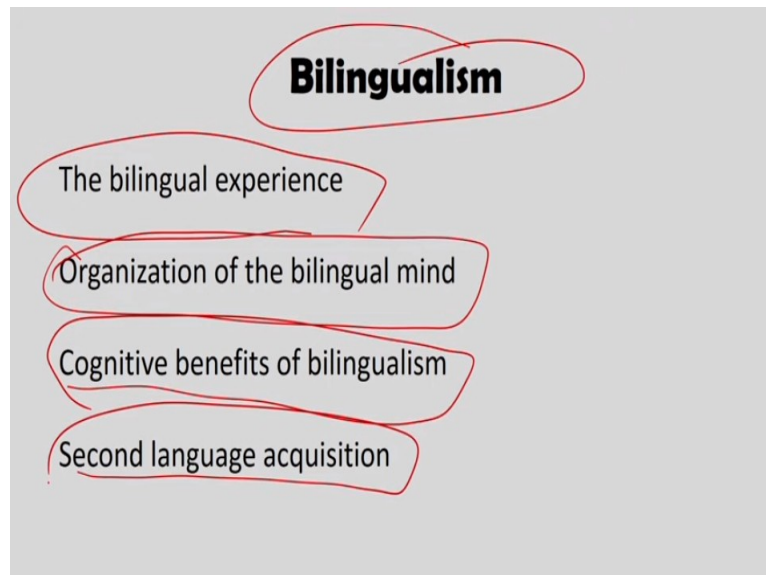
And so we thought, why not deal one more point, which is the idea of bilingualism of how people with two languages exists. So we started by looking at what is the bilingual experience, we looked at how many people of the world are bilingual in nature, and they speak two languages at the same time. We looked at the bilingual world and the different dialects of the bilingual world. We looked at how mutual intelligibility and several other factors help in bilingualism.

We looked at how multi general bilingual are out there and we also looked at something called codeswitching, which is using words from both languages in, either in a single utterance or in multiple utterances, and how this codeswitching helps bilingual children in some way. We also looked at how language provides an identity to some people. We then focused on the organization of the bilingual mind, we looked at, in a bilingual, how both the languages are activated in the brain of bilinguals every time they speak, regardless of the fact that which language they are currently using.

We also looked at transitional equivalence are words of two languages and they refer to the same concepts and how they provide some idea of the bilingual mind. We looked at how bilinguals have fewer vocabularies in each language and what kind of difficulty can the bilingual disadvantage, what kind of difficulties are the bilingual can have.

We also looked at weaker link hypothesis which explain that bilingual disadvantage by suggesting that bilinguals are less practiced at using words they know since they need to split the time between two languages and that is one disadvantage bilinguals have. We looked at

the revised hierarchical model, which propose a separate lexicon for each language, which links to a common conceptual level.

We also look at translation occurs either by passing through one conceptual level or via direct links between the two languages. We also looked at something called the sense model, which takes into account the fact that most words have multiple meanings and do not fully overlap across languages. An extension of this model is also takes into account the cultural differences into imagery evoked by words.

So, this is how the bilingual mind is organized. We started looking at the cognitive benefits of bilingualism. So, bilingual's ability to quickly and accurately switch from one language to another language carries over to the nonverbal cognitive tasks. So, how this bilingual ability helps in other cognitive tasks, living with two languages also lead to better understanding about the nature of the language, this is called meta linguistic awareness.

We also looked at the bilingual advantage in nonverbal task as based on the three cognitive skills, for example, the interference inhibition, the selective attention and the mental flexibility and how these three processes work together to produce the executive control. We looked at lifelong bilinguals generally outperform monolinguals on test of executive control and how this is an advantage. We looked at how there are structural brain differences between lifelong bilinguals and monolinguals account for the bilingual advantage.

We looked at the phenomena of cognitive reserve, which refers to the ability to resist the debilitating effects of dementia in old age and so how bilinguals have this advantage and finally, we looked at despite the concerns of many practitioners raising children with language disorders are bilingual causes no additional delay in learning ability. And lastly, we focused on how the second language acquisition happens in bilinguals. So, we looked at the ultimate attainment in second language acquired through puberty.

So how puberty is the cutoff point, so if you learn the second language before puberty, the accents, you would have the original language accent and how if you attain the language after puberty, although you have ultimate attainment, which is basically you develop the second language just before its mastery or little bit before its mastery, but still you will not be able to have the correct accent. The critical period hypothesis explains the effect that age of arrival

on our ultimate attainment of second language acquisition by proposing the children have a biological predisposition to learn the languages.

We looked at how the speech learning model experiences ultimate attainment in a second language in terms of time spent in the two languages income in the community context. We looked at how some bilingual children, they grew up in homes, where each parent speaks different languages and so how parental home environment can be made more supportive for bilinguals. We looked at two approaches for bilingual education.

For example, transitional programs aimed to assimilate heritage language of the student into the mainstream. So, we looked at the transitional program and the two way immersion program of how these two different programs can help bilinguals. And we looked at how adults and children bilinguals, they compete with each other, and how children and adults bilinguals, they have this this kind of, the children's have some kind of an advantage over adult, children bilinguals have some kind of advantage of adults in terms of learning the second language.

And so, that brings an end to this particular course, on The Psychology of Language. We have traveled through a lot and I have discussed a lot with you here, reviewed everything that we did here. Now, this course was a design for people who want to learn a little bit about language.

So, if you go to the course and the notes, which are provided by the course, you will have better understanding about the course and not only the better understanding, but since this course was not dedicated to linguistics as such, it was a course on understanding the basics of language or basics of the psychology of language. So, the course should be dealt in that manner, it should be dealt in very superficies manner, in a very surficial manner and the course should be taken in that manner.

Now, if you take the course in that manner, in a very light manner, you will certainly learn something from the course and something about language and the psychology of language. So what I would suggest is not to go into too much details into each topic and just refer to the lectures and the notes provided with it. And given that, you would learn some amount about the psychology of language or language for that matter.

And can use it use these principles in your everyday life. So given the fact that you look at the lectures, study the notes provided with it and look at the slides and do a little bit of research or follow books which have been provided with it, I think you would do good and fair good and get good marks in your exam. So with that hope, that you fair good marks, that you come up with good marks in the exam, it is a final goodbye and thank you from this studio on the book studio at IIT Guwahati. Thank you, goodbye and good luck.