Introduction to Cognitive Psychology
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Lecture – 22
Comprehension and Understanding of Language

Hello friends, welcome back to this second section on language. Now in the first section of language, we saw what is language? We saw how it differentiates from communication and we saw several parts of language, how it is made up of? What is a syntax? What is a phoneme? What is a morpheme? And then what is semantics? What is pragmatics? So, basically that comprises of what a languages is and then at the end of it grammar. So, basically what language is? What it is composed of how these things the rules of grammar really work into language and so on and so forth?

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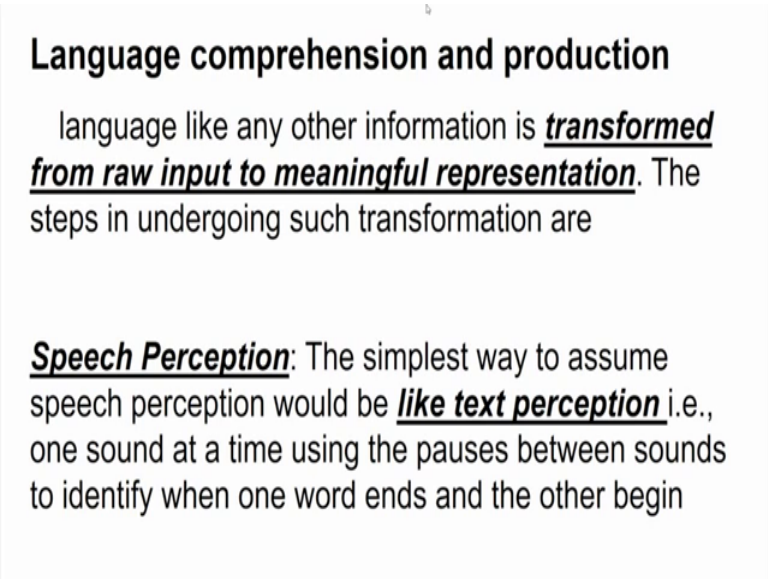

Now, in this section we will focus on to something called understanding comprehension of language and the production of language. So, first section was describing things about the nature of language and the second section is about producing language and understanding comprehending language.

So, basically let us start this session and try and understand how language is comprehended, how language is understood or how language is produced. Now language like any other information which is being transferred from one person to another, is

basically first taken in as a raw input and so and it is transformed. So, the basic components of language are first perceived through a language processing unit in the brain and then it is, the raw materials or the raw parts of the language are then processed by this language processing unit. To form meaningful representations where these representations then mean something or has some semantic value.

Now the steps, which are followed in taking the raw language input and then processing it, so that a meaningful representation a semantically meaningful representation is created, what are the steps into it? Let us look into those. So, the question is how does speech perception happen, how do you perceive speech. Now as opposed to perception of words which we do one word at a time, one by one so how does one conception happen or perception of letters and numbers happen.

So, basically what we do is we do some kind of fixation and we do some kind of jumps and these fixation and jumps happen from the first word to the first letter of the word, to the last letter of the word. Then there is a gap and within that gap the meaning of the word is evaluated and then we go to the next word.

And similarly, in terms of speech perception since perception of words happen in this way in individual materials happens in the way that I just described, so it is basically believed that speech perception should also follow something like this. And the simplest way to look at how are perception would happen is to be like text perception; that is one sound at a time should be perceived and the pauses between the spoken word, two spoken words should be used to identify the meaning of the words. This is how our general knowledge should be, because text perception basically takes place as I said you, it takes place in terms of a word by word perception.

So, the first letter of the word and last letter of the word is basically looked into this is called jumping or fixations, which I does. And based on that there is a gap and if there is no gap then perception of letters become difficult, but this gap between letters actually help the brain to interpret the meaning of the word and so this goes on and this is how the meaning is generated.

So, in speech perception also it should be we assume that it should be similar that, a word by word is perceived each word that somebody is speaking, now when I am speaking to you, how the perception should work in this way, that you should be

perceiving each word and the gap in my speaking, the time gap between two words when I speak, that should be utilized for making meaning out of it. So, that is how we believe it is, but that is not how actually it really works.

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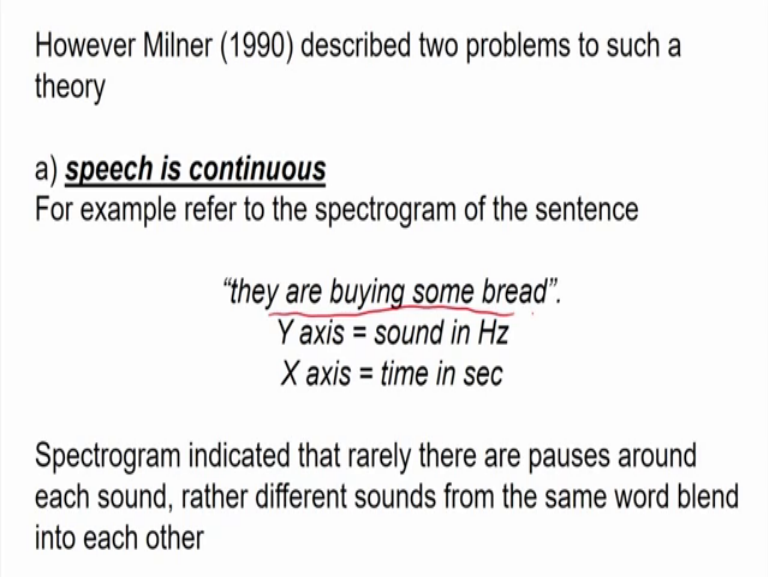

So, Milner 1990, he described two problems with such a theory which says that word by word perception happens and meaning is generated from those kinds of words and what is these two problems? First Milner, he found out that speech was continuous in nature. The nature of speech was continuous and so how does it happen for example, refers to the spectrogram. So I will what I will show as show you spectrogram, so what is the spectrogram actually, this is an output of speech. So, once you produce speech the there is a air pressure so just in front of the mouth. So, one once the words come out of your mouth a certain air pressure is created and this air pressure is measured through a instrument and then it is displayed in through a spectrograph through a CRT tube or a spectrograph. And that is how what is a basically a spectrogram is.

So, the amount of pressure which is generated when you speak certain words against when you no speak nothing is presented on an x y coordinate in terms of voltages in terms of sounds and in terms of the sound in Hertz and on the time axis. So, that is how a spectrogram really works. So, spectrogram is basically these pressures that I emit when speaking a word and the graph of it, which is in terms of sounds in the produce in terms of hertz and the width through a particular time period.

So, I am just going to show you a spectrogram of the word that I am written down here. So, they are buying some bread, let us look at this and if we find oblivious stops or obvious gaps in the spectrogram it would mean that speech is not continuous and so each word after each word there is a gap.

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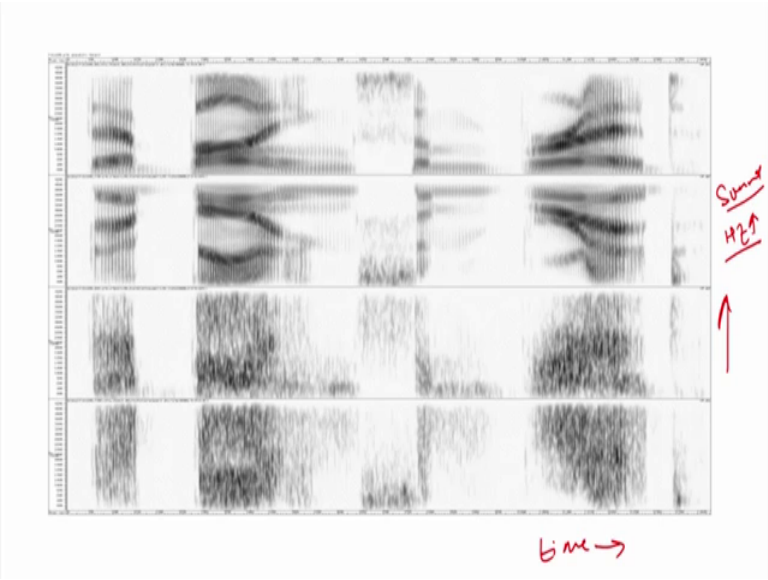

So, let us look into it. So, spectrograms this is a spectrogram as you can look at. And so when you look at the spectrogram it is one continuous the emission of one continuous graph which is out there so on this axis we have the time and on this axis we have the measurement of sound; in terms of Hertz right. So, air pressure basically in terms of Hertz and so what is the result of this? The result of this is a spectrograms indicate, that rarely there are pauses around each sound. So, once the sound is produced there are no pauses between them and rather different sounds from the same words blend into each other.

So, what happens is when I say they are buying the bread, what really happens is the end of and the beginning of are, are blended together and so there is no graph and that is what Milner pointed out; he said that speech is continuous. So assuming that speech is like perception of text is not correct; one reason being that it is continuous I just showed you that this sentence they are buying some bread, in terms of a spectrogram how it will look like and we see that the word endings, they sort of merge into each other and so there are

very few chances or there are no chances for gaps between them, which negates the idea that people get timed to between spoken language to make meaning out of it.

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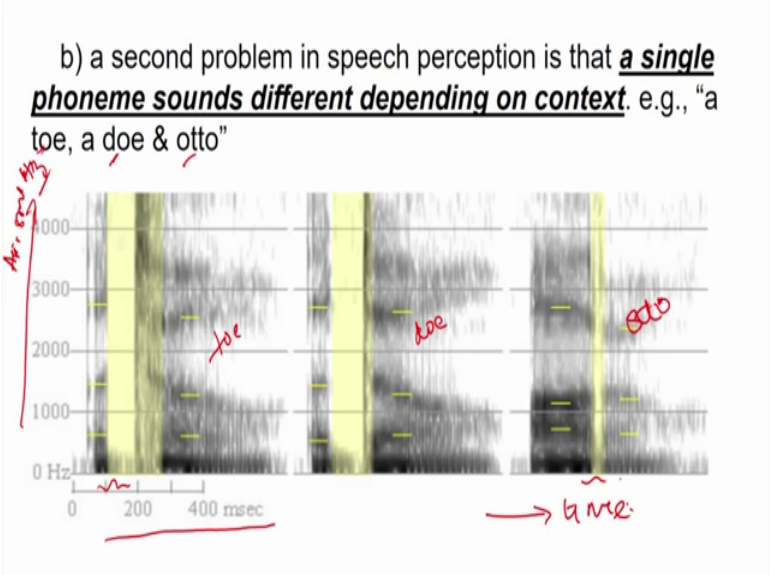

Now, the second problem which Milner listed is the fact that a single phoneme when if it is changed into a spoken text, the context changes. For example, if I remove if a toe, a doe and otto can be made these words can be made by replacing the t, d and o phoneme. So, a single phoneme if have taken out or if it is replaced or if it is misheard in certain way, what would happen is the word would itself change; and so one single phoneme, one single speech sound and phoneme is a very basic idea.

So, one simple problem with hearing this one on would actually lead to the interpretation or would actually lead to different interpretation altogether. And so what I have here is that this same phoneme, so you have this is for toe, this is for doe and this is for otto. And as you can see here that this is the time axis; in terms of time as you see its 200 400 millisecond and this is the pressure air pressure so in terms of sound pressure, in terms of Hertz or cycles per second. And so what you see, is that the same kind of spectrograph you can see for both doe, toe and otto but only the beginning changes, so replacing a phoneme for example, t replaced by a d or o the beginning of this changes, but more or less it is the same right, and so that is what it is one for phoneme changes the whole idea of the word or whole meaning of the word changes.

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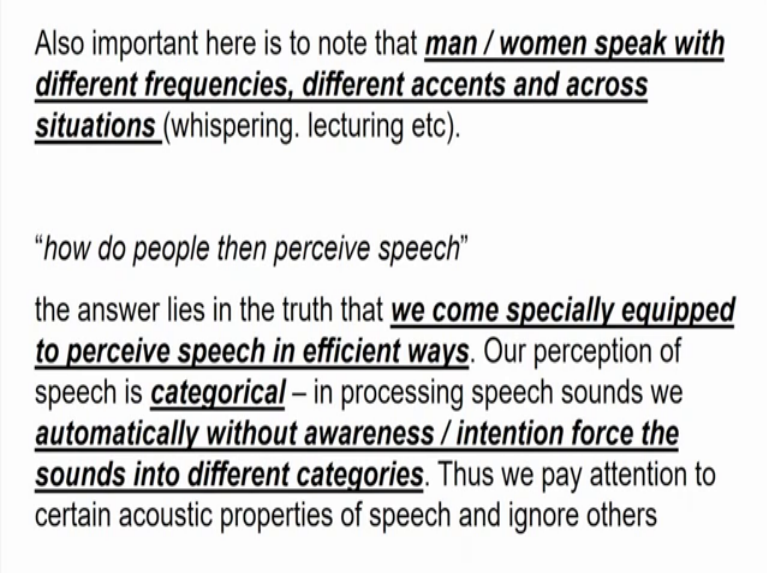

Now, these are the two facts why it the why sound perception cannot be similar to speech perception? Now, another problem which is to be noted is that men and women they speak in different frequencies, different accents and across different contexts; they people speak in different ways, so it is not about gender, it is not about how women and men speak together, it is also dependent on the kind of frequency. So, some people speak very softly, some people speak a little bit loud; the kind of accents that people use so it is it is could be a raw accent, it could be a toned up accent or any reason at different situations. For examples in a lecture you could be whispering in some other for a when you are lecturing it could be a monotonous tone and so on and so forth.

So, across context, across different situations people both men and women use different kind of speaking or speak differently. And so this could be another problem which could lead to the fabulous speech perception is not like text perception. So, then if it is not like text perception how is speech perceived then, what is the way in which speech perception happen and the answer to this is that speech perception is generally categorical in nature and that is what it is the answer is that we come specially equipped with systems which perceives speech in an efficient way in a very efficient way and that is called categorical processing.

So, what happens here is that certain categories are automatically made and so when we speak the speech is automatically without awareness, pushed into these categories and that how we actually go ahead and process speech. We pay attention to certain acoustic properties of the speech and ignore certain others.

So, based on the acoustic properties, we can tell whether a person is male or female remember experiments from the attention section, where we saw that from the unshadowed ear people were able to tell things like the tone of voice and the gender of the person who is speaking. And so these things are automatically attention is paid onto it automatically and so people were able to tell from the non-shadowed ear also.

So, basically in categorical processing, what really happens is there are certain categories and these within these categories when you when a person is speaking, automatically we perceive or we force the spoken speech into these fixed categories and this happens without awareness we are not we really aware of the fact that we are doing it.

So, we are not perceiving it in a continuous manner, we are not perceiving it in the break out manner, but what we do is certain categories arise so what is a noun, what is the verb kind of categories or different categories or what could be the constraint category and so we look into speech or with the hear speech and we take parts of speech and they we then go ahead and then push it these parts into different-different categories out there and that happens without of any kind of awareness, any kind of explicity into it.

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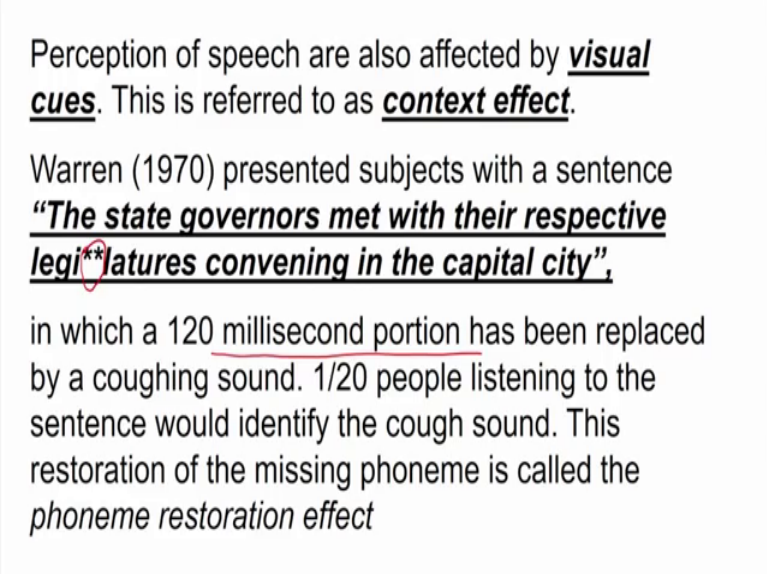

So, perception of speech is also affected by something called visual cues; and these are known as context effect. So, certain kind of visual cues in the environment they also affect kind of perception of speech that we do.

Now, the an experiment was done, to show that these different things that context affects perception of speech and so Warren what it did was, he presented a statement like this to people. Now the statement was the state governors met with their respective it should actually be legislatures right, and so that is what it is about where the word legis the word s would the phoneme s would come, he produced a coughing sound. So, the statement transcends the state government met with their respective legislatures concerning in the govern covering convening in the capital city.

So, this is what the basic sentence was, and so what he did was in the world legislature where this phoneme would be a cough sound was produced, a light cough sound was produced and it was amazingly people were not able to identify the cough sound. Only 1 out of 20 people actually they reported hearing the cough sound. 19 people did not did not actually report the cough sound and they could hear the word legislature very nitely nicely and the phoneme s here legislature. So, phoneme s and this basically is what is called the phoneme restoration effect.

So, in which 120 so that is what it is, so sorry this sentence of presented and 120 millisecond portion was replaced; then this was 120 millisecond portion where a phoneme was there and a coughing sound was induced. So, 1 after 20 percent listening to this actually found out that there was a missing phoneme and most of the 19 people restored this phoneme and that is called the phoneme restoration effect. And that demonstrates that the percept the perception that we actually do, is a categorical in nature. So, we do not look for look through word to word we actually force implicitly or without awareness we force part of sentences into preformed categories and that is our perception of speech really happens.

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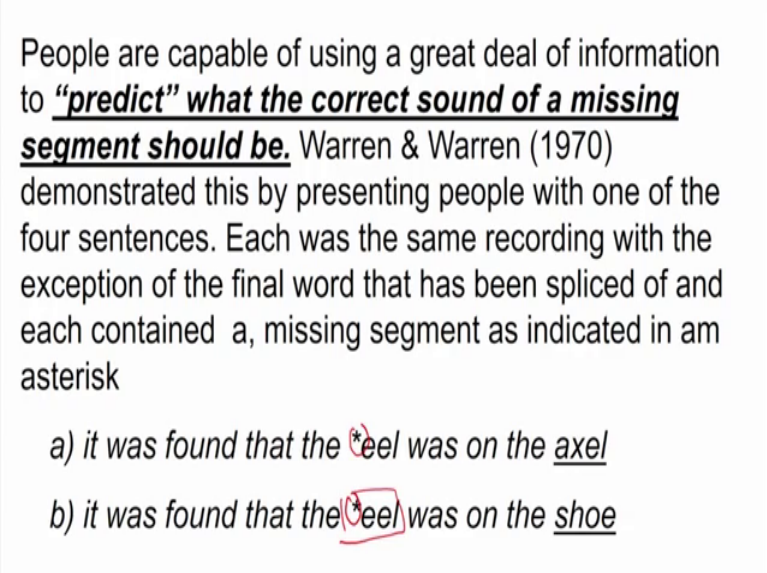

So, the answer to this or the result of this experiment was, that people were capable of using a great deal of information to predict what the correct sound of the missing segment was and as I said that people were able to restore this phoneme, they did not notice this break which was there and because they were doing categorical processing. They were not even aware of it, this is been replaced by a cough sound.

Now, Warren and Warren in 70, they demonstrated this by presenting people with one of the four sentences, so they are people presented people with these four sentences. Now each one was the same recording with the exception of the final word has been spliced off and each contained a missing segment as indicated in the asterisk on.

So, basically what Warren did the Warren and Warren did, first to find out whether people are able to restore this phoneme or not or perform this phoneme restore restoration; which basically means that, are people capable of implicitly filling up gaps into spoken speech to demonstrate that what Warren and Warren did was, he presented four different sentences to people with one phoneme being spliced off and what he wanted to see was whether people restored these phonemes or not.

So, there were four sentences present to people with a missing segment and each of this, in each of this the missing segment is the key to making meaning of the sentence. So, what were the sentences, the first sentences was it was found that eel was on the axel, the second was it was found that star eel was on the shoe and so this star which you see here

is basically the missing phoneme here. And so I am pretty sure by now you would have come to know the answer for all of these and so this was what was replace so in worst case this eel was related to an axel, in the second case this eel was related to the shoe, in third case it was related to an orange and the fourth case it was related to a table.

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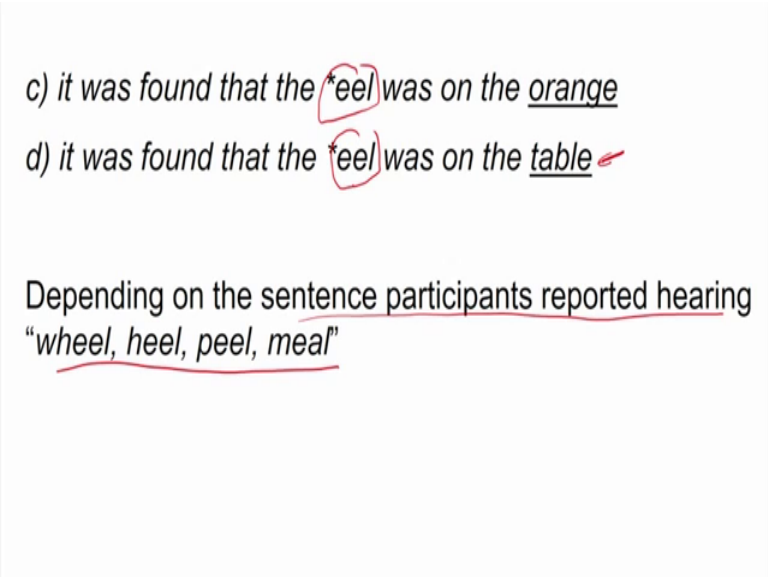

Now, take a second and tell me what the eel should actually be? And I am pretty sure that you would have come up with an answer. So, in the first case when the axel was presented, the context help people to replenish back or to fit in the right phoneme and so people perceived wheel there, but in the second case where it was the shoe people did not say wheel, but people perceive the eel the part where the phoneme was spliced off as heel, not wheel. Now wheel was for axle; because the axle is the context and so wheel was replaced. In if shoe is the context then what was replaced was heel. In the third case when orange was the context, when orange was what was being referred to the missing portion became peel whereas, in the fourth case when table was what was the context or what was the whole sentence was referring to; it was meal correct. And that is what it is and so depending on the sentence, participants reported, hearing wheel, heel, peel and meal.

So, basically they restored these phonemes of w h the h h in heel the p in peel and the m in meal. This kind of thing is that which basically again proves the hypothesis; that people perceive speech sound automatically and implicitly and how they do it? They do

it through something called categorical processing right. And so speech perception is basically not like text perception, people do not wait over speech, segments and the gap between speech segments are not utilized for making meaning, rather the perception happen in the categorical automatic manner.

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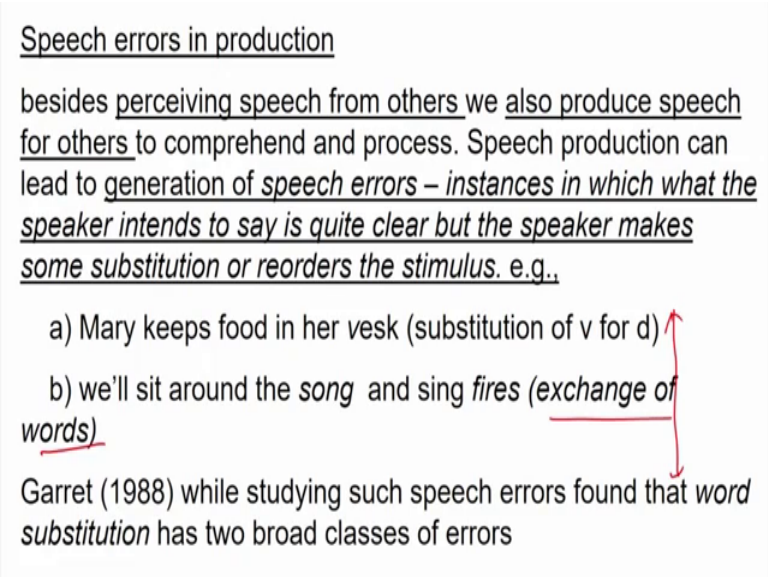

Now with the perception of speech or speech itself there are certain errors, which are there when we produce speech also. So, certain areas can also arise when production of speech happens. So, the so beside perceiving speech from others we also produce speech and to for others to comprehend and process the speech fear. So, it is not only always listening, we all sometimes also talk. So, we produce speech and so this is called speech production.

Now, speech production can lead to, speech production itself can lead to certain kind of errors which are called speech errors; interactions in which the speaker intends to say quite clearly where the speaker makes some solutions substitutions or reorders the stimulus in a certain way. So, speech errors then are certain substitutions or certain reordering of the statement; which makes the sentence not legible and so these are happening these happens because we do some kind of a reordering in sentence productions, or we do some kind of a substitution in sentence production and those are called speech errors.

For example Mary keeps the food in her vesk. Now when we say vesk, actually this is wrong and so has happened is so we would see these kinds of things happening in smaller children. And so what has happened here; obviously, you can see is the desk the d is replaced by the phoneme v and so what has happened is Mary keeps food in her desk. So, instead of the desk the by production itself it becomes vesk and it happens to most of us. We do these kinds of problems.

Another is or another sentence which shows this kind of speech production error is this one, where we sometimes make this kind of errors also where what we have done is its exchange of words. Sometimes we replace phonemes or sometimes we exchange words also. So, look at the sentence we sit around the song and sing fire. And so it happens to most of us you will realize that people who can speak English they can have these kind of errors in to it. And so here what has happened is the song is replaced by fire. So, the actual sentence should be we sit around the fire and sing songs and so, out of some substitution in speech production what has happened is fire goes to the end of the sentence song comes to the middle of the sentence and our sentence becomes we sit around the song and sing fires; which has which is syntactically correct. it is semantically correct, but makes no meaning at in it.

So, in terms of pragmatics make no meanings. So, in terms of grammar rules is perfectly correct, but has no meaning and so this is an error of speech production. And this error arises because we substitute certain words for certain other words.

Similarly, Garret 1988 while studying such these errors found that the word substitution has two broad categories of errors. So, this substitution of words this exchange of words can then also be divided into two different classes two huge classes out there. And what are these classes? One of what substitution can error have what substitution error can happen in terms of meaning relations. So, in terms of meaning relations in the sense that I can substitute a word by another word, which is equivalent to the meaning of the first word.

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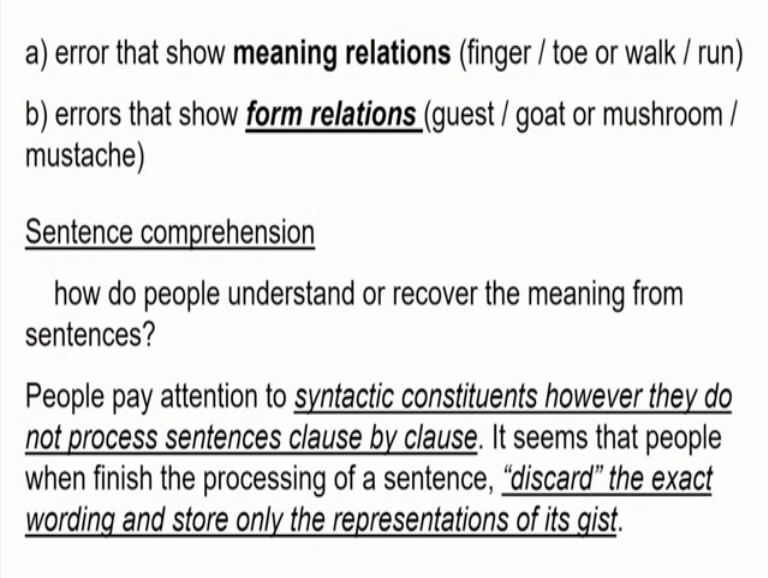

So, here replacing finger with a toe or walk with a run is what meaning relations are there. So, finger and toe are more or less like similar in meanings of what finger does, is what a toe would does and walk and run are more or less same in meaning, similar in meaning exactly not the same, but then similar meaning and so people could actually do this kind of word substitution error and these word stution substitution errors are meaning related errors or people can go ahead and form relation errors.

So, form relations errors are generally very few it is very few that you will see these kind of errors and. So, what you do here is instead of a guest you would say goat. So, the guest has come the goat has come right or mushroom is replaced by mustache. So, let us go to the field in and pick up fresh mustache instead of the mushroom.

So, form relation errors can also exist and so Garret says that these are two kinds of speech errors or speech related errors that can exist and so these speech related errors can also create or are also categorized into form relations and meaning relations ok. So, this is up till now we have seen that in the production of speech also, so not only that writing language or written language has some kind of errors while producing speech also, we create a number of errors and so what we saw up till now is, how speech is produced and this production of categorical speech, the production of speech itself which has which is categorical in nature this can also lead to certain kind of errors; which the producer of the

speech is making and which confuses the listener and so he would be hearing something else right.

And so the question now is how do we comprehend the sentence right. So, when a somebody writes a sentence, how do we go ahead and read this sentence; so how do people understand and recover their meaning from sentences. So, given the fact there are certain sentences written. In fact, in front of you how do you make meaning from such a sentence? The answer to this lies to the fact, that people pay attention to syntactic constraints; however, they do not process sentence clause by clause.

So, what people generally do is that they look at a sentence and they look at parts of the sentence, or they look at the syntactic constraint of a sentence right, but then they do not process the sentence clause by clause. So, what really did they do they actually look at a sentence look at the constituent of a sentence a make a gist out of it and that is how they process a sentence. They actually do not read the sentence clause by clause and that is the way in which people go ahead and process sentences. So, after reading a sentence what people do is they discard most of the words in the sentence and just keep the meaning; the central representation, or the central meaning in terms of a gist representation.

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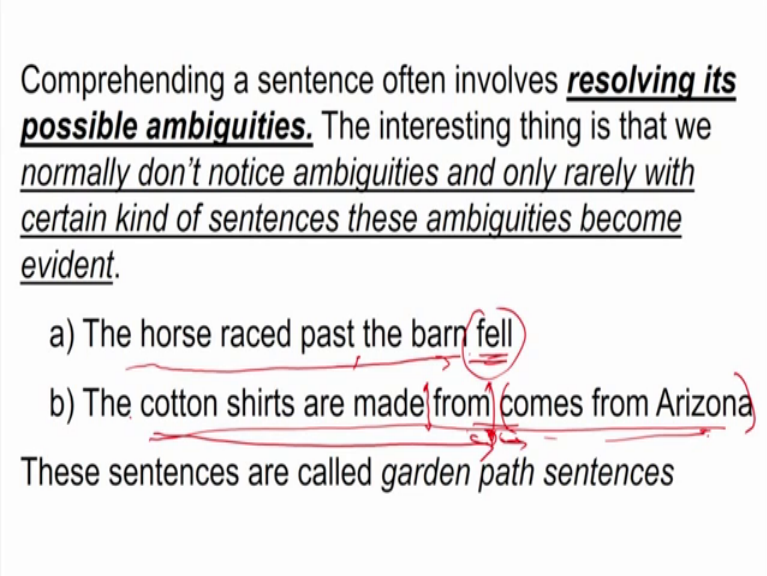

So, comprehending a sentence involves resolving its possible ambiguities. So, in sentence comprehension also certain kind of errors can occur and so it has been found

that people are very good in resolving ambiguities. If a sentence and we saw that in the first section also that even if the sentence is a certain problem people were able to resolve the ambiguity. For example, the first sentence that we looked at, the very yellow dog chase something we saw that people are able to people all they do not know the descriptive rules of grammar of how to correct the sentence, but they know the prescriptive rules and they know how to correct this. So, in terms of sentence comprehension also people are very good in resolving these ambiguities.

Now, in the interesting thing here is that we normally do not notice ambiguities and only rarely we come to notice them; when do we note ambiguities only when certain kind of sentences arise, or a certain kind of certain parts of the sentence have some confusions in to us.

Now, look at this sentence; the sentence says the horse raced past the barn fell. Now if you look into the sentence what happens is initially the sentence is all right the horse raced past the barn; till the point that you come to fell and fell is ambiguous and these kind of sentences are called garden path sentence. So, you it leads you to a certain direction of meaning, but then the last word creates a problem and so what is the problem? So how do we go ahead and solve this, what is this is obviously, an ambiguity, so how do you solve this. One way to solve it is the horse rate raced past and put a comma here the barn fell two parts of the sentence, two sentences to look at no makes meaning or the horse raced past the barn fell can be broken now into this two constants and so till the point of time that you are reading the horse raced past the barn it is ok, but a fell the word fell itself is a problem. And so here is the problem so you can solve it by this way and this type of sentences actually lead to ambiguities or look at this (Refer Time: 26:57).

Now, this sentence is the cotton shirts are made from, comes from Arizona not from, from the beginning of the sentence if you read there is a pertinent meaning that you see to it, but at a point a certain point certain word arises which creates confusion. For example, the cotton shirts are made from comes from Arizona. Now there is a problem here, the cotton shirts are made from expects certain input as some form of it all right, what fine form of cotton I am destroying that kind of cotton qualifying the cotton example.

So, simplifying this sentence so basically if you want to make meaning of the sentence so the here is where. So, even from the shirt the cotton shirts are made from, made from comes from Arizona is where the problem really comes in. And so you want to solve this sentence the ambiguity, ambiguity is this part of the sentence if you want to solve the ambiguity what we really do is cotton shirts the if we put a comma here the cotton shirts are made from comes from Arizona then the sentence losses it is an ambiguity and becomes a more meaningful sentence.

But reading from on words in to say in this way creates an ambiguity and so this kind of sentences creates ambiguity, but with normal ambiguity because what happens is the people have already started reading the sentence and. So, it has made people started thinking in a particular direction, but then from the form on words, or from the barn on words the next word which appears creates confusions and so this kind of sentences make people assume confusions, or make people think about confusions and they need to then solve the ambiguity. So, these sentences are then called garden path sentences. The reason being that it starts making you think in a certain way and then at some point of the sentence it pushes you into a different a way right.

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Results from several studies suggest that *when we process ambiguous sentences*, *all the meaning of an ambiguous word are temporarily available*, through a an automatic bottom up process. *Context effects do not immediately restrict the listener* to the most appropriate "reading" of the word. Instead for a short period all meanings are accessible. *Three syllables after the presentation of the ambiguous word only one meaning remains active*, suggesting the people resolve sentence ambiguity fairly quickly.

So, results from several studies they suggest that, when we process ambiguous sentences all the meaning of the sentences are temporarily available. So, when we are looking at these kinds of ambiguous sentences; an ambiguous sentences which has multiple

meaning and the results from several experiments suggest that all meanings of the sentences are available for example, if there is a sentence saying that this room is full of bugs. Now both the meaning of the bugs the bugs as in terms of cockroaches or pets, or bugs in terms of listening devices are available to us. Depending on the context we then decide after three phoneme length which word meaning will be accurate.

And. So, results from several studies basically suggest that, so basically what it suggests is that when we are reading an ambiguous sentence all the meaning of the ambiguous word; the word which is creating ambiguity are temporarily available through an automatic bottom up process, so while reading a sentence every meaning remember the sentence where we use bank in two different ways in terms of financial institutions and in terms of riverfront. Now both the meaning are available if a sentence is this bank is creating confusion in your sentence both the meanings would be available at the time of processing the sentence.

Now, context effects do not immediately restrict the listener to most appropriate reading of the word. So, basically when we are reading a sentence, the various sentence is created the context in which a sentence is created, it does not stop the reader from interpreting all the meanings of the ambiguous word right. Instead for a short period all meanings are accessible to them.

Now, three syllables after the presentation of the ambiguous word only one meaning remains active. So, what happens is the context does not decide what is the meaning of ambiguous word of the ambiguous word which is created the word, which is creating ambiguity in ambiguous sentences; what really happens is three syllables after the processing of the ambiguous word, all meanings are available. Only after these three syllables has elapsed the exact meaning or the meaning which befits the context then remains and all other meanings are discarded. And so researches has been done on several kind of sentences and so since this we are not dealing in detailing language. So, I am not bringing in those examples, which will show you how these experiments are done and how it was basically found out, but this is the result of it.

So, three syllables after the presentation of the ambiguous word only one meaning remains active which is the meaning which is more up most appropriate to those contexts. Suggesting that people resolve sentence ambiguity, fairly, quickly; so, no

matter how ambiguous the sentence is. People are able to resolve these ambiguities and how do they do this resolving of ambiguity; the fact is we read the sentence, to the point they come to the fact that the word which is creating ambiguity and when they are reading the word, this is creating ambiguity context is the word the context of the sentence does not help them. Till three phonemes or three syllables after the presentation of the word all meanings are accessible.

But only after three syllable presentations which is a very very brief time, only after that the appropriate meaning, or the necessary meaning, or the most optimal meaning which befits that sentence remains and all other meaning goes away and certain experiments were done to create that. And so what does it actually tell you? It tell you that people are able to read up and because sentence is very fast and resolve ambiguity very fast right. So, although all meanings are available, but then people are very good in resolving ambiguities; although mean they may not know the grammar, they may not know what is wrong with the sentence, but they may that they can correct the sentence.

So, they have this feeling they have this implicit feeling, that is that is what we saw in the first lecture they say they have this implicit idea of what is wrong, but they may not know the grammar of where it is wrong ok.

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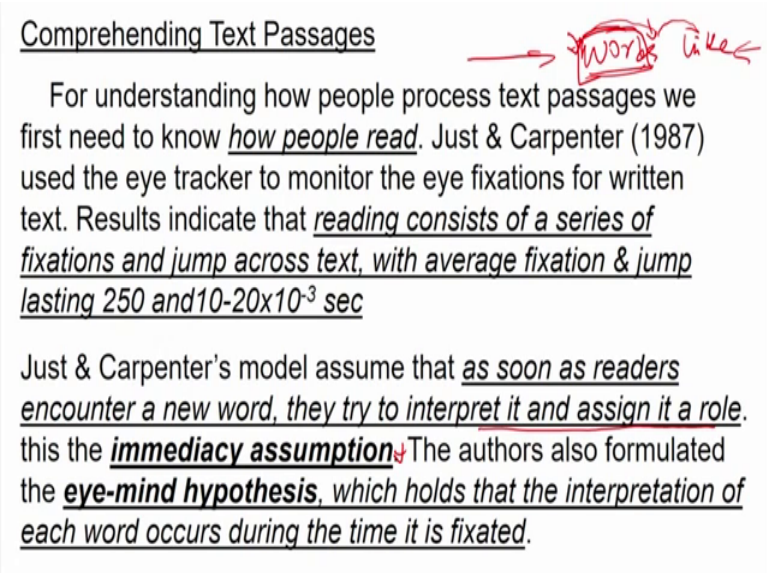

So up till now, we have looked at speech perception and sentence comprehension very good. Let us now look at what is comp the comprehension of a text passage or how text

passages are comprehended. Now for understanding how people process text passages, first we need to know how people actually read. So, what is the way in which people read and Just and Carpenter 1987 use something called an eye tracker to monitor the eye fixations for written text.

So, what they did was, they use something called an eye tracker. So, eye tracker actually tracks the movement of the eyeball as it move across written words and so from that they had some idea of how people actually read. Now results indicate that reading consists of a series of fixations and jump across text, with average fixation and jumping 250 and 10 to 20 into 10 to the power minus 3 second; basically 250 to 10 to 20 20 millisecond kind of a timeframe. So, basically then what they found out from the study is that, people just do not read text the way it is; with what happens is the eyeball tracking experiment suggests that people jump from word to word and they then have fixations.

So, when they are looking at a word they look at the first word, they fixative the they looked at the last letter of the word they stopped there for some time, make meaning out of it, jump to the next first next letter or next word the first letter of the next word, last letter of the next word, look at the context, find meaning next makes the jumps and make another jump into it; and so this kind of jumping and fixations are how text is percy. Now Just and Carpenter's model assume that as soon as readers found a encounter a new word, they try to interpret it and assign it a rule and this is called the immediate immediacy assumption.

So, in text passaging what just and Carpenter says is that when we are reading something in these fixation happens between the first letter and the last letter of the word and then we wait there for certain time that is called the fixation time and then we jump to the next word which is there. Now during this period when we make this jump this fixation and jump during that period we immediately encounter when we encounter that what immediately gather the meaning of the word and that is called the immediacy assumption. So, as soon as we get a new word we try to interpret what the word is; the author also formulated something called the eye-mind hypothesis and so what is it which holds that interpretation of each word occurs during the time it is fixated.

So, basically what then what happens is, when reading a text there are certain jumps in the eye actually does and so if you are reading at words like w o r d s and like these are

the two things that we are looking. Now I will first fixate here, stay here, then look at the last word d s, then there is a context to it since it is the language context and some words are related to context so we are teaching this, I am teaching this in a lecture on language and so the context is there. And so this w word starting with w ending with s or ending with d would be a word that is how the immediacy assumption is.

And. So, immediately that is what it is and the eye-mind hypothesis says that, as the fixation happens and I have before the jump, this word is interpreted this word is matched with are a segment or matched with a representation into the brain and a meaning is extracted out of it. And so these are what it is so immediacy says that an interpretation is as is done, as soon as the fixation happens and a role is assigned to it and the eye-mind hypothesis says that meaning is also extracted at the same point of time.

So, it is not only the role assigning to new word, what is the role of that new word whether it is a verb, whether it is a noun, whether it is a pronoun what kind what form it is doing a sentence or what is the role that is playing in a sentence that is called the immediacy assumption.

The eye-mind hypothesis says that the meaning is also extracted as that very time with a fixation time. So, fixation tells you what each word mean, what is the role it has in the sentence and what in a and how to interpret this role. In the eye-mind hypothesis says that also the meaning of the word is extracted at that point of time and that is how we read; so these through these fixations and jumps across words to words is how we actually read and that is how comprehension of text passages happen.

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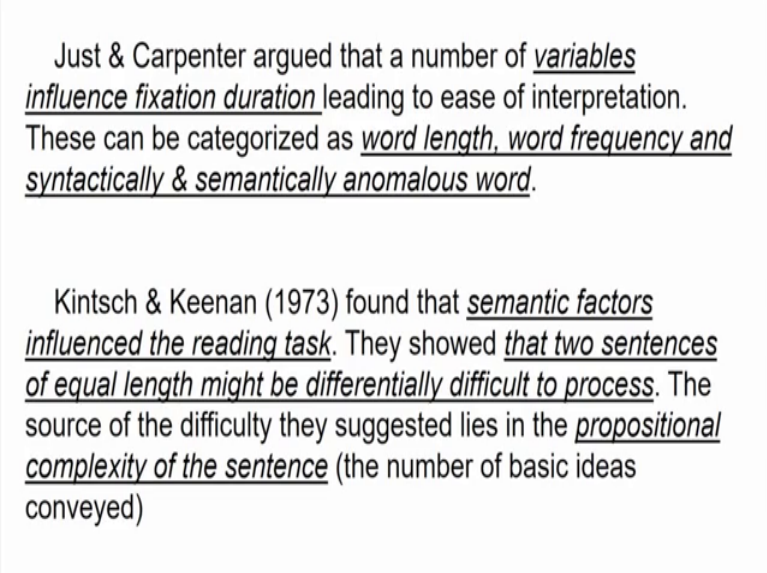

Now, Just and Carpenter they argued that a number of variables influenced fix a influences fixation duration. So, the time number the amount of time that the eye fixates on to a particular word, is influenced by a number of variables and so what are these variables for example, word length; the bigger the word length the more the fixation has to be right, also word frequency how frequently you see if this word. So, words like apricot, words like aloe vera was which people do not encounter in everyday life they require longer fixations then word like cat, dog, hen, food that kind of words which are more common the flood frequency the usage of these words are more common and syntactically and semantically ambiguous words.

So, if words are syntactically and semantically ambiguous for example, bank, two meanings of bank or bugs, two meaning of the word bugs or multiple meaning of the word bug or the position of the word is such that it can also be an adjective and it also be a noun that can happen. So, the word could qualify it could cruel mean too many things into it. In those cases the fixations are long or the fixations are of larger duration and the jumps are then quick not quicker its takes more time to jump and there are more longer fixation; because that determines how much time you have to spend into it, why because then you have to first if we have words which are ambiguous we have to first assign a rule to it; because that rule will tell you what this word means and what this word how this word is driving the sentence right.

And so basically that so longer the word, the more complex the word, lesser the frequency, more the fixation period; Kintsch and Keenan 73 they found out the semantic

factors influence the reading task. There are certain semantic factors which also go ahead and influence text comprehension for reading tasks. They showed that two sentences of equal length might be differential differentially difficult to process; and so they said that the semantic the meaning how much meaning a sentence carries how much ideas that the sentence carries that will also decide how easily a sentence can be read.

So, those sentences which has a number of ideas on to them they will be difficult to understand, they will take more time to comprehend or comprehension of sentences which have multiple ideas embedded into them, will take more time then sentences which have simple ideas and so they presented something like this.

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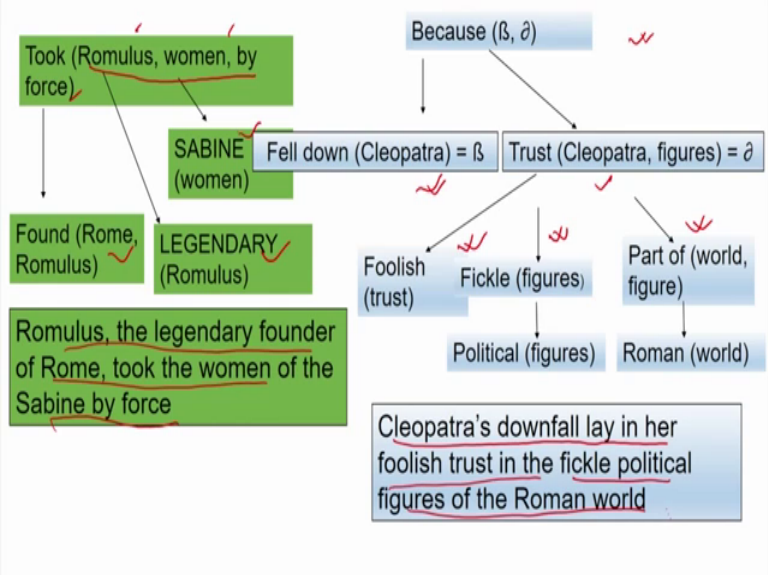

So, the word is Romulus the word is Romulus the legendary founder of Rome, took the woman of the SABINE by force and so there are two or three ideas into it and so you look into Romulus woman and by force are three ideas. And then you have SABINE is a woman there these are two other things and so the number of ideas are limited here three ideas and so it takes some time to process.

In comparison to that, if you look into it is the same length; the second sentence is also the same length, but here the number of ideas are more and so it takes more time to process and what is the sentence Cleopatra's downfall lay in her foolish trust in the fickle political figure of the Roman world. And so if you look into it there are multiple ideas into it or a multiple segments into it, now because of what because of trust of Cleopatra,

Cleopatra fell down and within that within the trust what kind of trust there is a foolish trust, there is a fickle trust and there is the part of the world. So, that is related to the Cleopatra and figure in one idea and Cleopatra falling down is the other idea.

So, trusting of Cleopatra is one idea and the falling down of Cleopatra is another idea and within that there are certain systems which are there and if you look into it has multiple ideas right. And so if it has multiple ideas it will take more time to process and so the more meaning more ideas that have the more meaning is to be interpreted, the more meaning of sentence has the more time it will take to be interpreted and the more fixations are required into it and the longer duration of comprehension for such words would occur.

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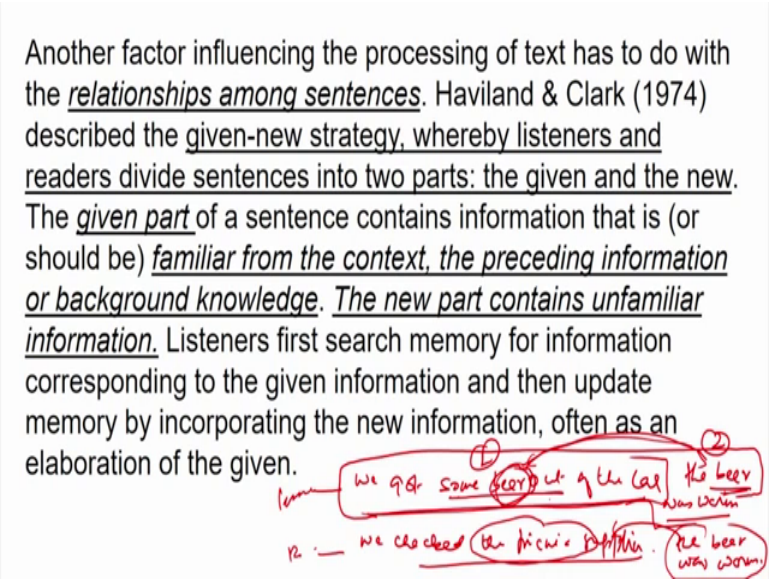

Now another factor which influences the processing of text has to do with relationship among sentences; what sentences? or how sentences are related to each other. So, the more the sentences are related to each other the larger the relationship or if those two sentences are not related to each other then it will take more time to be process. Now Haviland and Clark 1974 describes something called a given new strategy and what is this given new strategy; they say that whereby listeners are listeners and readers divide sentences into two parts the given part and the new part.

So, when they are listening into a sentence when people who listen to a sentence they are listening into a sentence they immediately divide the sentence into two parts. One is the

given part the other is the new part. Now the given part of a sentence contains information that is familiar from the context of the preceding information or the background information. So, when you are listening to a sentence what you tend to do is break the sentence into its two part; first part is the given part the given part has all the informations or given part has all the inputs from preceding context or from where the borrower over effect from previous sentences and people are familiar with it.

The new part contains unfamiliar information, new part of the sentence they can contain unfamiliar information. So, listeners first search memory for information current corresponding to the given information and update memory by incorporating the new information, offer as an elaboration of the given part. So, basically then let us look at a sentence and then see how does this thing really work. So, basically what I am doing is I am creating two sentences and with a given part and a new part. So, if I write this sentence we got some beer out of the car. This is the first part and the second part is the beer was warm.

So, sentence number 1 sentence number 2 right; this is the given part and this is the new part. Similarly we checked the picnic supplies and then again the same this is the given part and the beer was warm. Now in which case do you think people will take more time to comprehend? Yes you are right in the first case people will take lesser time to comprehend the sentence, the reason being that in the given sentence in the given part of the sentence the mention of beer is there and so it makes a relation with this sentence and so the comprehension is easy.

So, basically they got some beer out of the car and so they were warm it is easy to interpret, but in this case the mention of beer is not there in the first sentence and. So, you do not know how the new part connects to the old part. And so then first you have to make the assumption that beer is part of the picnic supplies, first you have to make this supposition assumption only then you can comprehend this sentence.

And in this case it is easy because previous contexts provide you that idea and so if this is a given new sentence people will take lesser time to verify this one, then this one because the first part of the sentence contains the referral to the new part right. So, this is basically what they say. So, in a be in a given new strategy the more different the given and new parts are the more difficult comprehension turns out to be.

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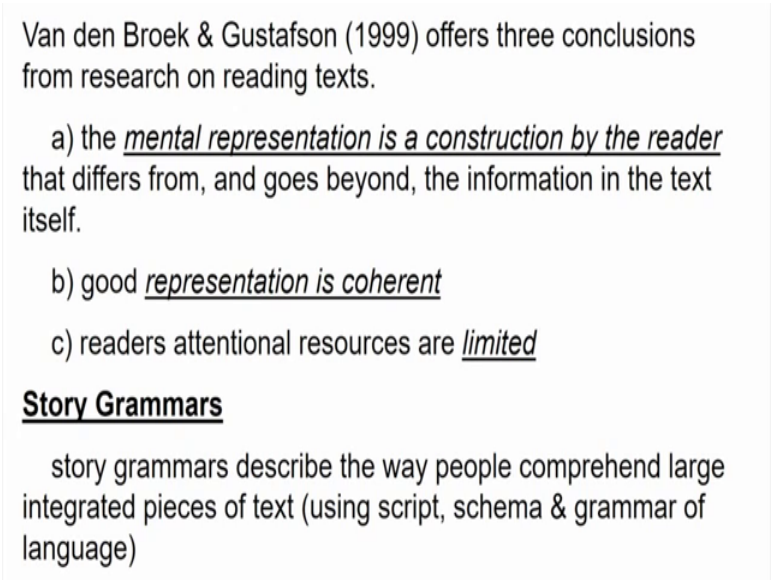

Now, Van den Broek and Gustafson in 1990 they offered three conclusions from research on reading text. First the mental representation is a construction by the reader which differs from and goes beyond the information of the text itself, when you read something and that is why I always advise my students to read books; what happens is when you read something you make a new world out of it and a new construction.

You go beyond the book and imagine things which are not written even in the text and so people own this mental imagery and so in that in the last chapter on mental imaginary we saw that people have this mental imagery, make these mental representations in visual form. So, once you read up text, people make certain imaginaries or certain texts or certain kind of formats which are personal to them and so they go beyond the what is written in the word and that becomes personal to us and so these personal things this these personal influences representations that we make of text help us in understanding something.

So, when people read something, they create a mental representation which is personal to them and it is beyond what is written on to the text. The second is the representation is coherent; when we read text the representations have to be coherent in the sense that it is linked in ways right. So, one part of the sentence text should always be related to the second part and that is coherency is there. So, even if we read elect if you are reading a

novel we read the back part first and the front part in the middle of the novel, we still make this coherency the fill up gaps is there and this coherency is always maintained.

And the third is readers attentional resources are limited. We cannot be very ambiguous in writing sentences if we write very ambiguous sentences the actions attention span of the resources is limited, text comprehension will be flawed. So, when writing a text for comprehending we should be assure of the fact that first whatever we are writing people are there people will misinterpret it or people will create their own construction out of it. So, it should be very limited it should it should be written in a way that, it should give the chance for lesser representation, varied representation also the representation that we form the writing that we do should be coherent it should not be all over the place having all kind of meanings into it.

And third it should be written very strictly in ways that respect people's attentional resources; which basically means that the idea should be clearly spread out. If it is not then people's attention resources are very limited and so you will keep on jumping from ones meaning to others you write them. So, this is how text comprehension happens. Now let us look at an interesting fact which is stories, how do people comprehend stories? We have looked at how people comprehend text. Now let us look at how people comprehend stories.

So, what is the way in which people actually read stories and so far reading story it has been found that there is something called story grammars. So, story gammas are described as the way in which people comprehend large integrated pieces of text using script, schemas and grammar of the language. So, while reading a story, while reading a novel, while reading some kind of art work, work or fiction or nonfiction when reading any kind of large text, which they need to comprehend they use certain kind of grammars which is different from the kind of grammar that we saw in the first part of this lecture, what is it then?

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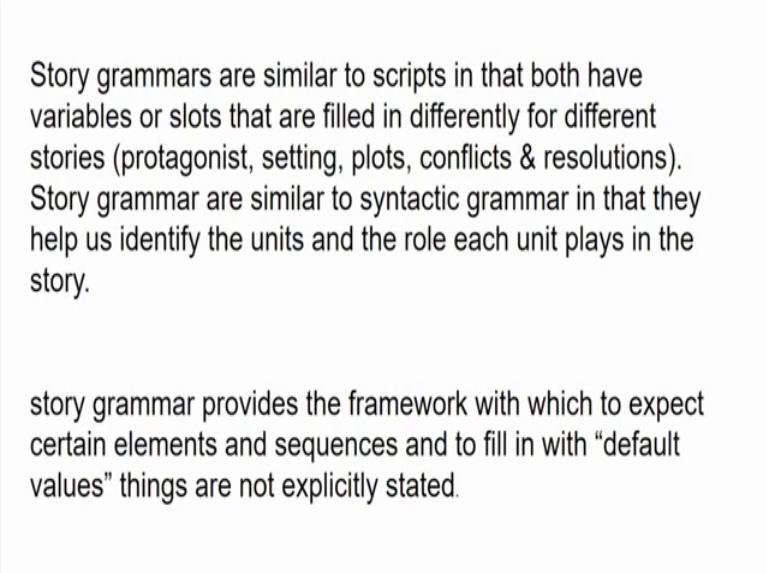

So, what are story grammars? These are similar to scripts in that both have variables or slots data filled in differentially by different stories. So, basically story grammar is kind of a script right. It is kind of a block and so what this block does is it this block says that each story should have certain fixed factors into it right. So, what story grammar suggests is that people expect certain kind of fixed factor.

So, for example, when you are looking at a story each story should have a protagonist the person who is the one who is acting the main component of the story, or the main person of the story then it should have a setting where the story is setting from, where it is coming from, where it is based on, a plot or what really happens in the story? What is the baseline of the story? background of the story conflicts and resolutions, then if you are writing a story there has to be some kind of a conflict and then the storyteller resolve this conflict and all these are expectations that people have and these are called story grammars.

So, every story should have things like this these type of grammars on to it. Now story grammars are similar to syntactic grammar in that they help us identify the units of each role plays in the story. So, basically like what grammar does for us, what syntax does for us? Because syntax tell you in a sentence what is the subject? What is the object and what is the verb and what role each object is playing in a sentence and that helps you into making a legal sentence.

Similarly, story grammars actually tell you the main constituents of the story what is the protagonist? Who is the protagonist? What is the plot? What is the setting? What is the tone? What are the conflicts which are there? What are the resolutions? So, that you come to know in one brief look into it what the stories about? Or what the story is going to tell you right. And so these are fixed factors it is story grammas are like syntactic rules for grammar. Now story grammars they provide a framework with which to expect certain elements and sequences and to fill with default values things are not explicitly stated.

So, basically story grammar then tells you that any story has to have these things; now if it is not if something is not explicitly mentioned here we fill it implicitly to make a story. Let us look into what story grammars is, so this is basically a story of the 3 little pigs now; obviously, when i say a story of the 3 little pigs there are certain expectations that people have, what will this story have right.

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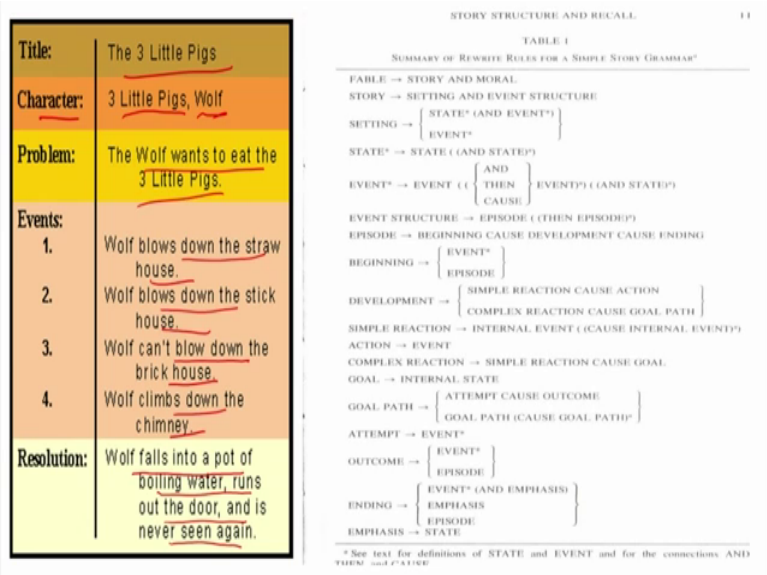

And so first of all there should be character, the protagonist and the protagonist is there has to be first of all if it is a story about 3 little pigs. So, three little pigs have to be there that is the main thing.

And then if the 3 little pigs are there just 3 little pigs going around is not going to solve our problem. So, conflict has to be made and for a conflict and a willingness to be and antihero has to be in put in and that is what the wolf is. So, story grammars then give you

this idea that only the hero is not going to make up a story. So, some kind of a villain has to be brought in, anti hero is to brought in because the anti hero and hero when they collide will produce the kind of problems or the kind of difficulties contradictions which has to be resolved later on, because no stories work around this way.

And so I have now created a wolf. Now obviously, if there is a villain and there is a hero then there has some kind of problem has to arise because they do not cannot heroes and villains cannot live together and. So, what is the problem here, the wolf wants to eat the 3 little pigs. Now we have a story in condition, so we have a problem we have certain characters into it we have all the characters into it and we have a title of it. So, lets then write the story certain events into it. So, we can relate to what I had done is we have put in some. So, wind blows the house wolf blows down the straw house, then wolf blow down the stick house, wolf cant blow down the brick house wolf climbs the chimney and so these are the 3 kind of houses these pigs have they leave in.

And. So, once the wolf goes ahead and blows it the pigs create a new kind of a house why they created a new kind of house because they are afraid of this particular wolf and they does do not want to be eaten and so this is the this is the is a set of events you can create any kind of event just as the look into it. And then the resolution is wolf falls into a pot of boiling water and sort or the open door and is never seen again.

So, the resolution is in the wolf is going to eat the pigs, so the resolution is these pigs were actually boiling water and the wolf comes down a chimney falls onto the water burns himself and says that, no I am not going to do this again learn this lesson and goes away and never returns back again. So, this is how a story is created this is how situations is created a certain contradictions are created and so on and so forth.

On this side you will see the story structure and recall and so I will leave it to you to actually read. So, basically there are different kinds of things in a story for example, what it is? What is the event, structure of the event, episode beginning development, simple reaction and so on and so forth?

So, basically then more stories have these kind of fill in gaps and so this is how a story grammar really works and so what is the need for a story grammar, because it gives us certain kind of insight of how a story is going to work and then if something is missing we can always go ahead and fill that particular thing.

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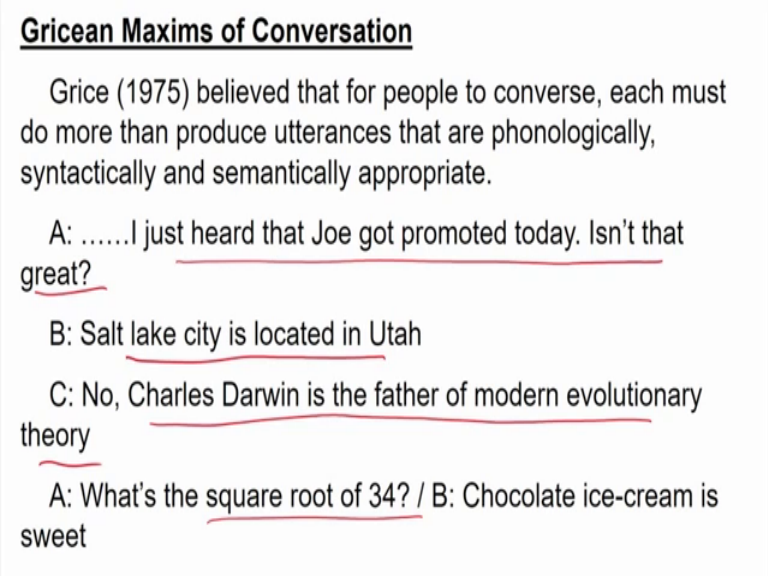

Now looking at something called Grecian's maxims of conversation. Up till now we have looked at something called speech, how it is perceived, what is grammar? What is sentence perception? All those things but there are certain maxims of conversation, there are certain rules of conversation which needs to be followed and so Gricean gives these mixing.

So, grace 1975 believed that for people for con to converse each must do more than just produce utterances that that is phonological sound they must syntactically and semantically produce sound which are appropriate. For example, if you look into two sentences I just heard that Joe got promoted today is not that great if A is saying and B says the salt lake city is locate located in Utah and the third is Charles Darwin is the father of modern evolution, they are not conversing at all. There is no conversation although all the sentences here are semantically correct, syntactically correct, have meaning, but they are not following a conversation.

So, there are certain rules of conversation. So, what is it what is the and again the A comes up with the answer then what is the square root of 34, B says that chocolate ice-cream is sweet. So, basically this is not a how a conversation is actually progressing.

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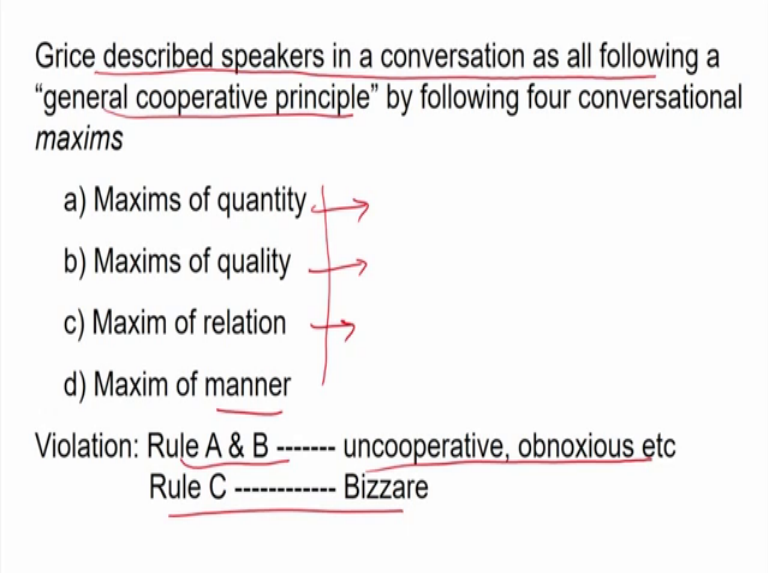

And so Grice described the speaker in a conversation should actually produce some kind of a maxim. So, follow some kind of a rules into it the four maxims are there first is the quantity; whenever we speak we should speak in terms of quantity we should not speak more we should not speak less but we should speak enough.

For example, somebody ask you the time and you say 4 o clock this is not quantity because 4 o clock could be morning, 4 o clock could be evening. So, you should have given enough information not too much information, but enough information. Then quality; quality in the sense that whatever you are saying should have some kind of a context some kind of a quality into it. If there is no quality that you have into your speech, if you have no context into your speech or know the meaning into your speech then it will not be processed in the right way.

Then you have maximum of a maxim of relation. If you are speaking a sentence and two parts of the sentence make no relation. So, I am going to I am going to the market and sun the sun is shining on my head and the two sentences have no relation with each other. So, when you are saying two sentences or when you are saying a sentence both the parts of the sentence should have some relation and so this maxim of relation should be always followed. It should not be awarded it should not be (Refer Time: 56:16) and also the people should have or speak sentences which have relationships or which express relationships into each other.

And four is the maxim of manner. We should always have good manners if you are speaking in the wrong manner, so if you are speaking to somebody who is elder than you and you say come here sit down that is not a manners to which is to be done; similarly, speaking to people who are smaller than you. So, certain kind make sense or to be followed if it is some somebody you senior to you whose for old age please use words like please or some kind of respect has to be given and these are the maxims which is there.

Similarly, if you are referring to people who are below of your age of similar age it is ok, but of below age then you will have to use some kind of a mannerism into it if you do not then you are not known to be a nice social person. And so a violation of rule A and B is there then people are called uncooperative and obnoxious. So, just telling you something like giving parts and bits of information or no quality information no meaning information at all then people are known to be uncooperative and obnoxious and people violating rule C are known to be Bizarre because if we do not say relations if we just keep on saying things then they are Bizarre in nature.

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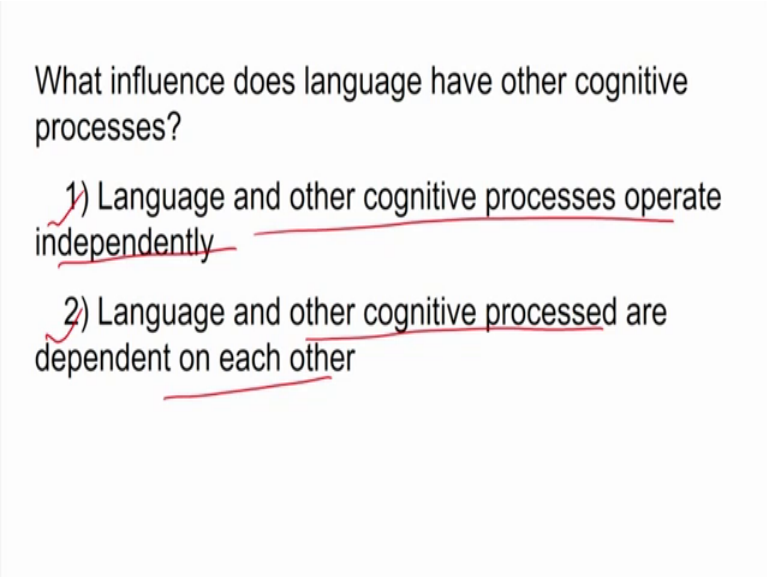

Ok then so what influences does language have other cognitive process? Up till now we have seen what is the language? And now and how it is related to different cognitive processes. So, what is the influence that these languages or the language has on different cognitive processes? So, there are two ways to look into it; first language and other

cognitive process operate independently, one view says that and the second is language and other cognitive processes are dependent on each other and both of this view; one view says that they are separate, language has nothing to do with other cognitive process and the other view say that they are integrated together and both of these are further explained by two popular hypothesis of a language in language cognition.

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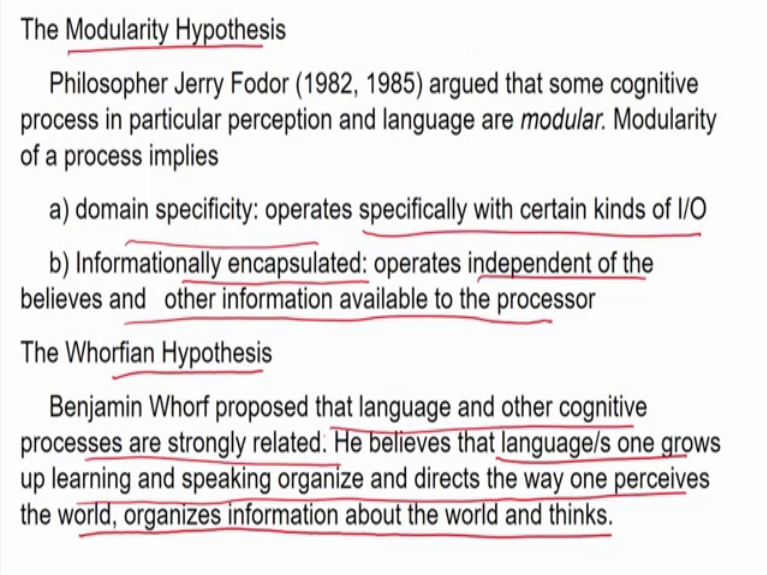

One of these hypothesis is called the Modularity hypothesis and so what does this hypothesis actually say so it was proposed by John Fodor philosopher in Jerry Fodor in 1982 85 argued that some cognitive process in particular perception and language they are modular. So, they process or they do processing in a modular formula. Modality of a process so what is modularity then modularity of process says that it is domain specific operates specifically with certain kind of inputs.

So, language then is modular because it operates only through certain kind of inputs. If you give the wrong input language is not going to work; similarly with perception if you give the wrong input perception is not going to be taking place and so the perception to take place a certain kind of input has to be given. And the second is Informationally encapsulated which basically means that operates independent of the believer and other peoples information available to the processor.

So, no matter what people believe language is independent, the processing of language is independent what we say is obviously, indepen[dent]- dependent on the context or what

we believe, but the processing of language if somebody says something to you how it is processed that is in informational informationally encapsulated; which means that language processors do not depend on peoples belief system or their expectations to process things and so this is how language is independent or language is not dependent on the cognitive process.

So, basically then modularity hypothesis or Fodors view is that language is modular in nature and that is why it is not related to any other because it has specific inputs defined and from this specific inputs is going to work and also the fact that it processing is not dependent on peoples believe systems, their expectations their views and so on and so forth. In comp in direct composition to this there is the Whorfian Hypothesis refer by a by a example or Whotf Benjamin Whorf was actually a chemical engineer. And so he gave the idea that language has to be related with other different kind of cognitive processes which is out there and so what did he say he say that language and other cognitive process are strongly related.

He believes that language development has a lot to do with the kind of atmosphere or the kind of environment for somebody is born with. And so the environment in which you are born shapes your language right. Somebody coming from a very rich environment will have a different kind of language in comparison to people who are coming from a lower socioeconomic backgrounds, people who are coming from those backgrounds where the language is not engage and so they are thinking their language their whole idea would change because the environment forces it. And so he believes that language as one grows up learning and speaking organizes and directs the way when perceives the world organizes information about the world around it.

That happens because the world around you, gives you a different nature of the world interaction with you or your interaction with the world gives you a different kind of feeling a different kind of a thought process and this thought process will then change the way language is there. And so when you see somebody from the street the way he speaks the way his thought processes and somebody from very a light background when you speak is look at you at his speech and the way he speaks both are different. And so this is the interpretation or difference the differences which is there.

So, basically then in this section on language what with this does we continued from the earlier section where we looked at what is a language and what are the parts of the language and we proceeded by explaining how language comprehension is done; or basically how speech is produced. So, we looked at what are speech production and how it is produced and what are the errors can that can arise in production of speech. We also looked at comprehension of text messages and comprehension or sentences and grammars.

We then looked at some principles of better communication of how people should be speaking and then finally, we looked at a very popular debate the modularity versus the non-modularity or the debate between the fact that language is like other cognitive process. And so it is interacting with them against the debate that language is different from other cognitive process, it should not be interacting.

So, this is the basic overview that we did in language we studied what is a language, how it is in the produced, what are the rules for it and so on and so forth. Later we saw it is the production of language the errors that happens with the production of language the comprehension how comprehension of spoken and written language happens and then late the errors that can arise there and then we looked at how stories are perceived. And to end with, we looked at a famous modular versus Whorfian debate into a language comprehension a language cognition.

Thank you.