

# **Fundamentals of language Acquisition**

**Prof. BIDISHA SOM**

**Dept. of HSS**

**IIT Guwahati**

**Week 02**

**Lecture 06**

Lec 6: Stages of development; Behaviorism

Hello, welcome to Module 2. Today we will start with the second module, which will focus on the various theories of language acquisition, starting with behaviorism, then nativism, constructivism, and so forth. We will also look at some other variables that can be called theories, but mostly it is better to consider them as variables that are part of this entire discourse on language acquisition, such as what those fundamental factors are and what those important necessities are that are part of language acquisition. That is important for language acquisition. So, in Lecture 1, which we will start today, we will focus on the stages of development from prenatal to infancy and childhood, and then we will begin with the theories. So, first, the theory will, as I just said, focus on behaviorism, and we will concentrate on a few scholars in this domain: namely, Sechenov, Watson, Thorndike, Skinner, and Bandura.

And then lecture 2 will focus mostly on nativism and Chomsky's contribution, the innateness hypothesis, and will follow it up with the constructivism of Luria, Vygotsky, Piaget, and others. So we will also have a short description of the Chomsky-Piaget debate. And then, from Lecture 3 onward, we will start looking at the other variables beyond these three important theoretical positions. So, for example, the critical period hypothesis, which is a very important notion within child language acquisition, the theory of mind, and then follow it up with more recent phenomena, more recent variables, joint attention, body schematics, and the last lecture will focus on methods.

Because from the lecture in module 3 onward, we will focus on the specific parameters of language acquisition, such as phonology, morphology, word formation, syntax, semantics, and so on. So, in many of those discussions, we will talk about the experimental studies that have contributed to our understanding. So, in order to understand those findings more easily, we will focus on the methods beforehand. So, we will discuss most of the important methodological concerns before we start talking about

the case-specific instances. So, that is what the road map is, but I have divided the entire segment into 5 lectures.

But please keep in mind that sometimes it will probably not be possible to have an airtight sort of compartmentalization; sometimes a little bit of one lecture might spill over into another lecture. So, there might be slight differences with respect to the roadmap provided here. Now, first things first: children learn language; all children learn language irrespective of where they are born, what kind of language environment they are born into, and so on. So, the language that is spoken around them is the language that children grow up speaking. Of course, we have to set aside the neurotypical from the atypical population; we are currently talking only about the neurotypical population.

So, the neurotypical population learns language effortlessly. But what appears effortless on the surface, you know, is actually a result of a lot of what you call mathematical computations behind the scenes. A lot goes on behind the scenes when we talk. Right now, as I am speaking in simple sentences, a lot is happening at a neurocognitive level. So, that is what makes it a very interesting domain to study, and that is why it merits study in its own right.

At the same time, as we have seen in Module 1, language evolution and language acquisition are intricately linked together. Hence, to understand language evolution and the evolution of language, we also need to study language acquisition in children. So, these are the two parameters on the basis of which the entire course is structured. Now, let us look at language development, stage by stage, starting with prenatal language development. What we mean by prenatal language development is language development that happens before the child is born, that is, at the fetal stage.

Now this is something that we have come to know only recently; by "recently," I mean a few decades. This was not empirically verified; though there were speculations about it, it was not empirically verified. What can we normally see? That the child starts its life with, you know, babbling, cooing, and other kinds of stages, and eventually goes on to speak a full language is true. But now we also know that at least some parameters of language development start before birth, and that is what we call prenatal development. In prenatal development, there is no production possible; as of now, the findings only talk about comprehension, indicating that the language spoken around the mother, including the mother's own voice, does elicit some sort of reaction from the fetus; that is all we know for now.

So, there are certain kinds of preferences, certain kinds of, you know, existing phonological knowledge that we expect in the prenatal stage, not throughout the prenatal

stage, but in the last trimester, and that is where most of the experiments have taken place. So, one of the important parameters to judge this by is the fetal heart rate and the motor movements of the fetus inside the womb when the mother is speaking. So, the mother's voice elicits differences in heart rate and also differences in the motor movement of the fetus. Similarly, the preference for the child after birth is also understood to have been established before birth. So, the language that the mother speaks is the language that the child seems to prefer immediately after birth.

So, there are many studies; of course, we will look at all of these in more detail in the next segment, the next module. But just to give you an overview of how things work, And in fact, there are interesting studies that have pointed out that even a baby's cry at 3 to 5 days old mimics the phonological pattern of the language they have heard inside the womb. So, the findings say that in French, when French babies cry, the pitch goes from low to high, and conversely, the cries of German babies go from higher pitch to lower pitch, and so on. So, there are some findings that bring to light that there is some awareness and comprehension, at least, of the phonological properties of the language to which the child is exposed before birth. That is what we are talking about regarding prenatal development.

After birth, of course, we can check comprehension as well as production; by production, we mean speaking. So, children are not born silent, as all of you are aware that their lives start with crying, and then there are various stages through which they go, which are universal; that is the most interesting part of it. So, in the beginning, they start with vegetative sounds; then, around 6 weeks, there is cooing; and from 16 weeks onward, they start to laugh, and all these stages are well established and attested in academia. So, six to nine months of babbling is followed by the one-word stage, which is also called the holophrastic stage, followed by telegraphic speech when they put two words together; it is not yet a sentence, but the two words seem to convey the meaning perfectly. By the age of 2 years, sentences begin to emerge.

Of course, there are some differences, and there are individual differences among populations, but largely this is the pattern. So, by 2 years, they start to speak in sentences, and by 2 and a half, complex sentences begin to emerge. Now, while this is kind of a universal phenomenon, how does it occur? This happens before the child knows how to count or many other things that we consider fundamental, but language precedes all of these. So, this is what has baffled researchers for time immemorial. How does a non-speaking and non-comprehending infant grow into a linguistically competent individual? Now, this question, of course, can be taken at a general level, but we know that they are not entirely non-comprehending and not entirely a non-understanding kind of creature.

They come with some amount of knowledge, but on the whole, they are not largely comparable to older children or adults. So, how does it happen, and that too in such a short period of time and in the same way around the world? These are the questions. Now, the reason it is also important to know this is that language itself cannot be learned through anything else. Most of the other skills are learned through language, but language has no known vehicle. So, that means you need to be in a situation like being thrown into the water, and then you have to learn how to swim.

And though we think there is a misconception that parents teach language to children, which is not exactly the case because parents themselves may not be aware of the rules, so to speak. So, no mother tells the child what a noun is, what a verb is, and so on; instead, the children figure it out. That is what we mean by teaching. Of course, the environmental input is present in terms of the caregiver's speech but not in terms of grammar. And so, how does it really happen? This is why it is surprising.

Language has no other tool to get there, to achieve a fundamental understanding, and children tend to figure out the rules of language perfectly by age 2, as we have just seen. Now, in order to make sense of this, there is a number of theoretical standpoints. Of course, the most important and well-known theories are the behaviorist, nativist, and constructivist theories. Behaviorist theory, as the name suggests, believes that learning is essentially a behavior, and it develops like any other skill. So, it is kind of a stimulus-response and feedback loop that creates language.

So, there is a stimulus, which is the linguistic input, and then the child reacts to it, and then there is feedback, either positive or negative. Within that loop, children begin to speak. So, language learning is like any other kind of skill development; it is a behavior. That is the idea. Nativist theory holds that children are born with an innate capacity for language learning, and universal grammar dictates the trajectory of development because all children are born with universal grammar, which is an innate capacity that is bioprogrammed into human beings; because of this, children learn to speak.

And that is why children around the world learn to speak languages through exactly the same kind of trajectory. The third theoretical standpoint is that of constructivism. Constructivism takes a stand where neither is the child a passive learner nor is there an innate system, but the child is an active learner. It is an active participant in the entire learning process, where it is constructed through participation. The child interacts with the environment and thereby generates an understanding of various things, including languages.

Now we will examine each of them in detail. So, starting with behaviorism. Now, when

we talk about behaviorism within the context of language acquisition, we tend to talk primarily about B.F. Skinner because he is the most well-known and also because of the way Chomsky reacted to Skinner's Verbal Behavior.

But Skinner was not the first person to talk about behaviorism, nor was he even the one who coined the term. So, we will go back a little bit in time and see where it started. Behaviorism has often been traced back to Ivan Mikhailovich Sechenov, who was one of the most pioneering and best-known scientists of 19th-century Russia. He is credited with a number of discoveries, understandings, and remarkable advances in various fields, such as neurochemistry, electrophysiology, the concept of the synapse, the anatomy of the brain, and many other areas. So, one of his most important publications, one of his most important contributions, is called "The Reflexes of the Brain," which was published in 1863.

This discusses sensory stimuli and how they turn into physical action. And it is not only about humans; it is also about animals. He is talking about various kinds of animals. So, I quote, "The nervous mechanism forms, in aggregate, part of the apparatus that ensures the intactness of the organism as a whole." He was one of the pioneering scientists to discuss the entire body's mechanisms, be they physical or mental.

He mentioned that this was controlled by the nervous system. He was also one of the pioneers in this field. So, any kind of stimulus that the organism faces results in a nervous reaction, which he called a reflex; that reaction turns into movement. So, there is a stimulus; as a result of that stimulus, there is activation, and you see movement as a result. So, this is the kind of loop we talked about.

The process of conduction from sensation to action is mechanical and automatic. This is where he got into trouble with the state because he said that a human is something like a machine. There is a force that works on the machine, and the machine reacts, somewhat sidestepping the individuality, mental state, and agency of the organisms. So, it is a relay with predictable results from any given stimulus. So, over a period of time, the stimuli and response system becomes predictable.

So, in this way, what he did was include all movements, thoughts, and emotions in the category of reflexes. There is nothing else involved in it; it is a reflex. Even though thoughts and emotions do not necessarily involve movement, he placed them all in the same kind of category. Now while doing so he also brings in the idea of inhibition. Today, in neuroscience and cognitive science, we know that inhibition is a very important concept for understanding human behavior, human cognition, and various other aspects.

Of course, there is action, but there is also inhibition of actions, which is an equally important factor. So, this goes all the way back to him again. He says that the nervous system also has an inhibitory property that stops certain actions from happening. So, thought is the absence of action, which means there is an inhibition of the action that could follow. Thought is an absence of action in response to a stimulus; it is the most important result of man's capacity to inhibit the last member of a reflex.

So, there are many things that are very difficult to put into a few slides about Sechenov's contributions to the domains of psychology, human understanding, and behavior, and so on. But his main connection to behaviorism is his vision of man as a machine. Not as a thinking being, but as a mechanism. So, it subsumes all voluntary movements, thoughts, and emotions under the rubric of external stimuli and resultant actions. And that is what behaviorism is all about, right? Behaviorism holds that the only things that can and should be studied objectively are the behavioral outputs of an organism.

That is what is visible, what you can objectively study, and exactly what he says as well. So all mental functions were to be understood as reflexes. So, in 1873, there was a lot of debate after the publication of his work; in fact, he was taken to court, and various things happened. So, he followed up with another important work titled "Who Is to Elaborate on the Problems of Psychology and How." Here he again ratifies his position; he clarifies that the same physiological substrates that underlie movements can also be used to understand the behavior of mental functions.

So, the only difference is the qualitative measure of central nervous system inhibition. So, you see how he connected stimuli to the functioning of the central nervous system, functioning in terms of acting or not acting. So, when you are talking about not acting, you are talking about inhibition, and then acting in terms of reflex actions. So, this is the loop that he created, and that is why we go all the way back to him and connect him to behaviorism. His legacy is, of course, not only in the domain of behaviorism; he has influenced a number of very important scholars who came after him.

For one, of course, Pavlov was greatly influenced by him, but not only Pavlov; even Vygotsky was influenced by him. Vygotsky's natural cultural theory of psychological development owes much to Sechenov's developments in his theories, and so on. Even the activity theory proposed by Leontiev traces back to Sechenov. So, there is a long list of important scholars who have been influenced by his work. So, in fact, Pavlov even mentioned that I quote, "I remember my own student days as though they were yesterday.

My mentor, Ivan Mikhailovich Sechenov, the father of Russian physiology, set me the task that has guided my life's course: the careful study of reflexes. His text, Reflexes of

the Brain, was very inspiring; he made what I can only call a bold attempt to apply the idea of the reflex to the activities of the hemispheres." So, he makes the connections very beautifully, such as neural connections, neural responses, stimuli, and reactions. Now, the term behaviorism was actually coined much later.

It was coined by John B. Watson in 1913, much later than Sechenov's work. But most of the research in the domain of behaviorism views Pavlov as one of the towering figures. So, Pavlov's findings on classical conditioning are what we start studying when we talk about behaviorism.

Then, of course, there is John B. Watson. So, the primary notion of this theory concerns the objective and observable aspects of human behavior and how they can be caused or changed. So, behaviorism was actually quite a revolutionary turn in the domain of science at that time because, before that, much depended on speculation, introspection, and so forth. But this was the time when psychology was established as a scientific discipline. And when you have a scientific domain, you need to have objective measures to find out how the system works, how the human mind works, and how humans, as organisms, work. So, that is why the focus was largely on the objective and observable aspects of human behavior.

So, the main goal of this was to find out the rules of the relationship between the stimuli and their responses. That is why we call it a stimulus-response kind of loop. Learning through this theory is a change in behavior based on experience, which is the fundamental aspect of behaviorism with respect to learning. Now, we will look at all of these scholars a little more closely with some explanation, but we will not have time to go into much more detail. Of course, everyone knows about Ivan Pavlov and his experiments with dogs.

So Pavlov, along with many other scientists of his time, was experimenting with various kinds of animals. So rats, rabbits, cats, and dogs were quite common, and only after some time did they start experimenting on humans. In fact, Watson was one of the first people ever to study human behavior as part of his experiments. So, Pavlov's dog, as we all know, is known to salivate when it gets food, but he noticed that the dog salivated even before the food arrived. So, he wanted to see if any additional stimuli could elicit the same kind of response.

So, he started to, you know, include the bell ringing along with the food delivery. So, there will be a bell ringing, after which the dog will get its food. So, over a period of time, when the bell rings, the dog will salivate, and so much so that after some time, because of these two things co-occurring constantly, the dog also connects the ringing of

the bell with the appearance of food. So much so that after some time, even in the absence of food, just by the ringing of a bell, the dog would start salivating. So, this is what he calls classical; this is what is called classical conditioning.

Now, a dog salivating while looking at food or getting food is not conditional because it is unconditional; this is a normal reaction. But salivating in response to an additional stimulus, which is the ringing of a bell in this case, is called a conditioned response. So, this is one of the first studies to find that learning can be conditioned. So, this is what this method is; that is why it has been called learning by stimulus substitution since 1928.

Now we move on to Watson. Watson's contribution is immense because he was one of the first to experiment on humans, as I mentioned. In fact, his "Psychology as a Behaviorist Sees It" is also often called the behaviorist manifesto. It lays out the understanding of psychology as a scientific, purely objective, and experimental branch of natural science. He rejected, like many others around the same time, the idea that introspection and speculation could be logical and valid methods. They completely rejected it because it should be replaced with what is called the objective and measurable type of experimental study.

So, his idea was that the theoretical goal of psychology is the prediction and control of behavior; additionally, it should focus on a scientific and objective approach. Now, he was very influential during his time; his theory was largely accepted, and he was even elected president of the American Psychological Association in 1915. So you can imagine how influential his theory is. And he is also credited with the success of behaviorism. Largely, the success of behaviorism rests on Watson due to his sheer influence.

And, in fact, it is because of him that behaviorism remained very strong until the 1960s. So his most famous experiment is called the Little Albert experiment, in which he experimented on a child named Little Albert. This happened around 1916. So, he started his experimental study with Little Albert in a hospital.

His mother was a wet nurse at the hospital. And because of that, the child spent a lot of time in the hospital, though he did not have any disease or anything; at that time, he was a normally developing typical child. But because he spent a lot of time and because of his healthy, because he was physically and psychologically healthy, Watson carried out this experiment on the child. He called the boy a healthy and emotionally stoic child. So, this is what happened: this is how the protocol went. In that hospital, there was a regular set of tests that was part of the protocol for many other kids.

They were first carried out on him to determine whether he was normal. And then it was followed by a few studies and tests to see if fear reactions could be triggered by stimuli other than sharp noises and the sudden removal of support. So, typically, when they ask how fear is created, it's because fear, as you know, is not exactly an inborn thing; fear is often learned, and it has been found that fear reactions are commonly elicited in children and infants when there is a sharp noise, when a loud noise suddenly appears, or when some sort of support system is present and then suddenly removed. But he was trying to figure out if there was anything else that could be added as a stimulus to elicit the same kind of fear response. So, at 9 months, the infant was suddenly confronted for the first time with a white rat, followed by a rabbit, a dog, and a monkey, as well as masks with or without hair, cotton wool, burning newspaper, and so on. He tried various kinds of tools, various kinds of things and these things were suddenly made to appear in front of the child and then removed and the child's reactions were recorded.

So, when these things appear on their own, the child has no negative reaction to them. He was stoic; he remained balanced, did not cry, and showed no negative emotion at all. Now, after this he carried out a different test. He combined a loud noise with the same set of stimuli. So, the loud noise was created by, you know, striking a metal object just behind his head.

So, very near to him, behind him, she was unable to see. So, there was a very loud noise, and then the child started to cry. He calls it a reaction, a crying fit. So he cried a lot; I mean, he was really very scared. Then, the team wanted to check if the fear could be conditioned with the other stimuli, namely the white rats.

Now, what happened? This happened when Albert was around 11 months old. The white rat was suddenly taken from the basket and presented to Albert. The white rat was given to Albert. Albert reached for it.

He was happy about the rat. He had no negative emotions—nothing at all. He began to reach out for the rat with his left hand. Just as his hand touched the animal, the bar was struck immediately behind his head. So, there was a metal bar behind his head that had been kept there for that specific purpose. So, a loud noise came out just as the child was about to touch the rat.

The infant jumped violently and fell forward, burying his face in the mattress. He did not cry; however, he felt sad. Then, just as the thing was repeated, the rat was presented to him, and he was about to touch the rat with his right hand when the bar was struck again. Again, the infant jumped violently, fell forward, and began to whimper. This I quote from his 1920 publication. Now, after a few trials with the joint appearance of the rat and the

loud sound, the rat was presented alone, and then the child immediately started crying.

This is exactly what Watson was trying to say. If a thing that otherwise would not elicit any kind of emotional reaction can be made to connect with a thing that would otherwise elicit negative emotion. So, in this case, a loud noise—so loud that it made the child fearful—the rat, individually, did not; and through this experiment, by making them appear jointly at the same time, the child was conditioned to react emotionally and negatively to the rat, which otherwise would not have happened in isolation. So, Watson characterized it as the most "convincing case of a completely conditioned fear response that could theoretically be depicted." So, this is a conditioned reflex again. So, the fear could be conditioned; you could elicit a conditioned response of fear by this kind of method.

So, after testing the child in this way, Watson wanted to find out if the fear that had been established was transferable to the entire environment. Is it only the rat, or is it the entire room, the furniture, and the other items? So, they tested him again after a few days. Albert did not react negatively to the room and its various items. But as soon as the rat was brought in, it started to whimper.

The experiment continued with rabbits, dogs, and many other animals. So, with this study, the authors also suggest that many of the phobias in psychopathology are truly conditioned emotional reactions, either of the direct or transferred type. So, many of the fear responses that we create throughout our lives, which are typically studied through psychoanalysis, actually are this kind of conditioned reflex because of some prior experiences; that's what he talked about. Another important name in this regard is Edward Thorndike. According to him, an organism has multiple potential responses to particular stimuli. But what stimuli get connected to, or start to pair up with certain kinds of responses, happens through the trial-and-error method.

So, the response chosen will depend on what received positive results, right? So, if a reaction results in a positive outcome, a neurological connection will be established; it will emerge over a period of time, and the chances of repeating the same response will increase in the future. So, there is a stimulus, and you react in one of the five possible ways, which gets you a positive result. Once that positive result occurs, your neurological connection is established, and as a result, you react the same way the next time. If the same thing does not get you a positive reaction and gets a negative reaction, then you do not try it again; next time, you try a different approach. In this way, humans go around searching for the correct response to a particular stimulus; this is what he says.

So, every time a negative result comes in, the organism keeps trying for a positive one.

Based on how repetitive the stimulus-response is, the organism will either learn or forget the connection. Thus, learning is essentially establishing a connection between stimuli, responses, and their neurological relationship. This came to be known as connectionism or association theory. So, during all of this, we have seen that starting with Sechenov through Pavlov, Watson, and Thorndike, everyone is talking about establishing a stimulus-response kind of connection. Certain kinds of stimuli elicit certain kinds of responses, and that is exactly what we call behavioral output; this can be established through various methods, and that is what we observe.

Now we come to our most famous person here, B.F. Skinner, who is very well-known in linguistics. So, in B.F. Skinner's idea, he built his theory on operant conditioning, which is different from classical conditioning.

Now, Skinner's theory actually gives more value to the reaction than to the stimulus. So, he believed that reactions do not always follow clearly defined stimuli; hence, they need to be studied more. So, he distinguished between two kinds of reactions: respondents and operants. Respondents are direct respondents to a stimulus. This is classical stimulus-response conditioning, which is called Type S conditioning.

Type R conditioning is what is most important to us. This is a spontaneous reaction that occurs without a stimulus. In such cases, the organism actively interacts with its environment. These reactions can be altered through reinforcements, such as positive or negative reinforcement, and this is called R-type conditioning. So, when the reaction to some stimuli is followed by reinforcement, the probability of repeating the same behavior increases. Hence, the reinforcer and the environment together can control the behavioral outcomes after a few repetitions.

That is how behavioral patterns are established in any person. So, Skinner proposes two kinds of reinforcement: positive and negative. Positive reinforcement increases the chances of repeating the same behavior, while negative reinforcement reduces it. He took his ideas on language learning and said that verbal behavior could also be influenced by reinforcements. So, if certain kinds of behavior get a positive reaction from the listeners, then you receive positive feedback that this is correct.

So, you do it more often. So, that is how you learn. Learning is also a behavioral outcome, and that is how it can be established. In fact, this idea was tested by Greenspoon in 1955 in a very interesting experiment. The experiment was like this: there was an interview scenario created, and the participant was asked to generate random words—anything that came to mind, just anything. And so he did not know what to say, and he started hesitantly, with some noun, some verb, something here and there. Every

time he generated a plural, the other person, the interviewer, somewhat agreed with him by saying, "Hmm.

" And this continued; only in the plural did he have a positive reaction. Over time, the probability of the person using more plural nouns increased significantly. This was a very interesting finding, and the same is then used to understand the conversation setup. Many of you must have noticed in conversations that when we talk, whether we are talking to one person or to a group, we keep looking at the faces of the people, and then we get a feeling of feedback. Am I making sense? Am I not making sense? Do they like my point of view? Do they not like it? Accordingly, we change our choice of words, the way we build our argument, and so on.

So that is exactly what Greenspoon was talking about. So, in any conversation setting when the speaker receives unconscious feedback on one topic and not the other we accordingly change our behavior. Now, the topic receiving positive feedback will continue, while the one that receives negative feedback will be sidelined. So, Skinner expands on this very idea, saying that language acquisition and use can also be explained by this mechanism. For example, children hear language in their environment all the time, and they try to imitate the words and sentences they hear.

This is what he calls operant behavior. This can receive positive reinforcement from the parents, you know, praising them, agreeing with them, or giving some kind of encouragement in any other non-verbal way, and as a result, that establishes the behavioral pattern of the child, and the child learns to speak and learns how to use the language appropriately in that particular condition. So, according to him, all human and animal learning can be explained through this operant conditioning method. Hence, there is no essential difference between humans and other animals in learning any skills. Thus, Skinner's theory can be summarized as a stimulus-response system.

There is a feedback system that can be either positive or negative. Language learning is like any other skill learned through observation, imitation, repetition, errors, rewards, and punishment. Reward and punishment will be our reinforcers. And this is what he calls operant conditioning, which is learning through the consequences of behavior. So, the kind of behavior output you have, if you connect it with the kind of reaction that you get accordingly, the behavior will be set; that is how conditioning happens.

Also important is classical conditioning, which is learning through associations. So, combining these two, Skinner's theory discusses how children learn language. Now, the habit formation and imitation methods have been used a lot in language learning and language teaching methodology. For example, the audio-lingual method for language

teaching,

and

others.

So, we will stop here for today. In the next lecture, we will continue with behaviorism. We will talk about Bandura's social learning theory, and eventually, we will move on to our nativist theory. Thank you.