

## Major Language Theorists influencing Learning of Mathematics

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**Abstract**

Language is one attribute that sets humans apart from all other creatures and binds humans together across all geographic barriers. A word can cause to sink into the deepest despair or lift us to inspired action. Language can be the tool for great achievement in any discipline. Good understanding of the capabilities and needs of the individual child and a sound knowledge and belief in the goals of language acts programme are vital factors in successful individualisation of instruction.

The theories of Piaget, Vygotsky, Chomsky, Skinner, Skemp, Coleridge, etc. debate the exact functions of language. Yet its role as a tool in conceptual thinking is undesirable. This paper tried to explore the significance of those theories in influencing language of mathematics, and thereby its significance in mathematics learning in developing countries.

## **Introduction**

Language is the vehicle of discretion, means the peculiar mode to transfer, transmit the intended message to the receiver. Everyone as human beings make utilizes it. Language is a purely human and non-instinctive method of communicating ideas, emotions, and desire by means of systems of voluntary produced symbols.

The importance of the role of language in the leaning process cannot be over estimated. Language plays a key role in unifying a vast and complex notion and in providing individuals with outlets for developing diverse skills and abilities.

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Language is a means through which thought is organised, refined, and expressed. In short, language helps in the formation of concepts, analysis of complex ideas, and to focus attention on ideas which would otherwise be difficult to comprehend.

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**Avram Noam Chomsky** (December 7, 1928)

Chomsky's view of competence, deals primarily with abstract grammatical knowledge. He held that linguistic theory is concerned primarily with an ideal speaker and listener in completely homogeneous speech community, which knows its language perfectly, and is unaffected by such grammatically irrelevant conditions as memory limitations, distractions, shifts of attention and interest and errors in applying his knowledge of the language in actual performance (Chomsky. 1965).

According to Chomsky, rudimentary form of language is stored in human brain. Language is a competency that is unique for man. We perceive language as the ability to comprehend and speak ideas. Even when two persons possess the same knowledge, observable difference is noted in their capacity to express the knowledge. Chomsky emphatically argues that the mind possess a distinguishable factor that could be termed as 'the language factor and it has well defined structure and system'.

The value of language cannot be fulfilled merely by familiarizing with a few words or sentences. A question is often posed. Does language influenced

thought or does through establish its authority over language. But Chomsky considers the two to be mutually complementary. When a structure is being taught, the purpose should be got constructed in the child's mind as an idea. This means, what is to be retained in the mind is not mere words or sentences but the ideas constructed.

For Chomsky, the focus of linguistic theory was to characterise the abstract abilities speakers possess that enable them to produce grammatically correct sentences in a language. Chomsky considered language as a highly abstract generative phenomenon. He asserted that human beings are born biologically equipped to learn a language and proposed his theory of a language Acquisition Device (LAD) – an inborn mechanism or process that facilitates the learning of a language.

According to Chomsky, there are infinite numbers of sentences in any language; all possible sentences would be impossible to learn through imitation and reinforcement. In his view, to study language is to study a part of human nature manifested in the human mind.

One of the fundamental aspects of human language according to Chomsky is its creative nature. He argues that something specifically about human language must be innate, that is available to us by virtue of being human, specified somehow in our genetic make up. Chomsky has shown that the mind cannot limit itself strict animation of behaviour.

**Jean Piaget** (9 August 1896 – 16 September 1980)

Piaget emphasized the importance of social interaction to intellectual development. Piaget saw interaction as the key to how we overcome the instability of the symbols we individually construct. Piaget tied the role of social interaction to the importance of language. Piaget tied the role of language in the development of conceptual and logical understandings. He made language an integral part of his ideas on intellectual development. Piaget linked the role of social interaction in intellectual development to the role of language.

According to Piaget, language is inherently a social factor partly because of the conventional nature of words and this conventional nature of words is crucial for conceptual development. Piaget offers an avenue for extending Vygotsky's approach to the inter play of conceptual and semiotic aspects in intellectual development. Piaget argued that formation of mental structures underlying feelings of logical necessity requires social interaction using a conventional sign system.

Piaget theorised that language was simply one of children's ways of representing their familiar worlds, a reflection of thought, and that language did not contribute to the development of thinking. Cognitive development, he argued, proceeded that of language.

**Lev Vygotsky (1896-1934)**

Lev Vygotsky is regarded as the founder of socio-cultural theory or the socio historical approach in psychology. Vygotsky's work, which is embodied in the literature on socio cultural theories of learning mathematics, has gained increasing importance in theorizing how students learn mathematics. Vygotsky saw that students internalized complex ideas (Daniel, 1990), but he extended the general constructivist approach by arguing that the internalization of knowledge could be better achieved when students were guided by good, analytic questions posed by the teacher.

Unlike Chomsky and Piaget, Vygotsky's central concern was the relationship between the development of thought and that of language. He was interested in the ways in which different languages might impact on how a person thinks. Vygotsky's theory views language first as social communication, gradually promoting both language itself and cognition.

According to Vygotsky, a word devoid of thought is a dead thing, and a thought unembodied in words remains a shadow. He emphasized word as a microcosm of human consciousness and argues that thought finds reality and form in speech. The speech structures mastered by the child become the basic structure of his thinking. The structure of the language one habitually uses influences the way he perceives his environment. A child first seems to use language for superficial social interaction, but at some point, this language goes underground to become the structure of the child's thinking.

In Vygotsky's view point, language is critical for cognitive development. He argues that language in the form of private speech guides cognitive development. The corner stone of Vygotsky's theory are the social significance of education and its relation to societal involvement. According to him, language and culture play essential roles both in human intellectual development and in how humans perceive the world.

The main difference between the ideas of Vygotsky and his contemporaries was regarding emphasis on an individual's interaction with his social environment.

An expert teacher is central to Vygotskian theory. The teacher's role is to identify the student's current mode of representation and then through the use of good discourse, questioning or learning situations, provoke the student to move forward in thinking. The recognition of a student's representation or thinking was seen as his/her zone of proximal development and the teacher's actions for supporting learning was described as scaffolding. When working in the zone of proximal development particular attention is paid to the language being used since the language of the student influences how he will interpret and build understandings (Bell and Woo, 1998). Within a Vygotskian approach, it is seen to be important that teachers use and build considerable language and communication opportunities within the classroom environment in order to build mathematical understandings.

According to Vygotsky, cognitive skills and patterns of thinking are the products of the activities practiced in the social institutions of culture in which the individual grows up. A clear understanding of the interactions between thought and language is necessary for the understanding of intellectual development. Language is essential in forming thought and determining personality features.

One essential tenet in Vygotsky's theory is the notion of the existence of what he called the "Zone of proximal development", Zone of proximal development is the difference between the child's capacity to solve problems of his own, and his capacity to solve them with assistance. Zone of proximal development includes all the functions and activities that a child or a learner can perform only with the assistance of someone else. The person in this scaffolding process, providing non-intrusive intervention, could be an adult (parent, teacher, caretaker, language instructor) or another peer who has already mastered that particular function.

An essential feature of learning is that, it awakens a variety of internal developmental processes which are able to operate only when child is in the action of interacting with people in his environment and in co-operation with peers.

By explaining human language development and cognitive development, Vygotsky's social interactionist theory serves as a strong foundation of the modern trends in applied linguistics. It lends support to less structured and more natural

communicative and experiential approaches & points to the importance of early real world human interaction in foreign language learning.

### **B.F. Skinner (1904 – 1990)**

Another leading theorist pertaining to language acquisition is B.F. Skinner, a man who opposes Chomsky's linguistic theory with his behaviorist approach. Skinner believes that behaviour explains the speaker's verbal activity as an effect of environmental contingencies. According to him, reinforcement of appropriate grammar and language would therefore lead to a child's acquisition of language and grammar.

Skinner's thesis is that external factors consisting of present stimulation and the history of reinforcement are of overwhelming importance, and that the general principles revealed in laboratory studies of these phenomena provides the basis for understanding the complexities of verbal behaviour.

According to Skinner, a child acquires verbal behaviour when relatively unpatterned vocalizations, selectively reinforced gradually assume forms which produce appropriate consequences in a given verbal community. Skinner considers communication of knowledge or facts is just the process of making a new response available to the speaker.

A basic assumption of his theory was that all language including private, internal discourse was a behaviour that developed in the same manner as other

skills. He believed that a sentence is merely part of a behaviour chain each element of which provides a conditional stimulus for the production of the succeeding element (Fodor, Bever and Garrett). The probability of a verbal response was contingent on four things: reinforcement, stimulus control, deprivation, and adverse stimulation. The interaction of these things in a child's environment would lead to particular associations, the basis of all language. Skinner proposed that language could be categorized by the way it was reinforced.

Whether the speech was internal or dialogic, reinforced positively or negatively, all language can be considered behaviour that is conditioned and learned. When Skinner wrote verbal behaviour, he attempted to explain the most complex human behaviour communication. This included all forms of language comprehension from dialogue to thought.

Though tribute to the behaviorist paradigm, Skinner's book generated more questions and concerns than it is explained. His show response coupled with both a growing disdain for the behaviorist paradigm and the influence of technology, and information processing led to the strengthening of the cognitive movement on psychology and other social sciences.

**Richard. R. Skemp (March 10, 1919 – June 22, 1995)**

Richard. R. Skemp was the major pioneer in Mathematics Education who first integrated the disciplines of Mathematics, Education and Psychology. He believed that children could learn intelligently from an early age, producing a

complete curriculum frame work for age 5-11 known as Structured Activities in Intelligent Learning. According to Skemp, language is seen as necessary condition for understanding and language is a pre- requisite for thoughts.

**Samuel Taylor Coleridge** (October 21, 1772 – July 25, 1834)

He was a great romantic poet and critic of English literature who lived in England during the 19<sup>th</sup> century.

Coleridge regularly advises that the best way to resolve an argument to define the term on which the disagreement depends. “Words”, he asserts are living powers, not merely articulated air”. This implicit connection between language and truth derives from his theory of language. Language expresses and records our knowledge through words, which signify not ideas, nor things but the relation between idea and perceived object. According to Coleridge, language is participating intimately in the complex relation between mind and world. Coleridge presents language as the principal vehicle for the interaction of knowing mind and shared, concrete reality. Language as the principal vehicle for the interaction of knowing, mind and shared concrete reality. Language expresses the contents and activity of consciousness. Although language itself doesn’t constitute reality, it expresses the constituent forms of the understanding: the power to make relations, and hence to began to discover divinity active in the world. In explaining the relation of ideas and laws, Coleridge defines the content of language or the form of total reality which language names.

Language is one the manifestations in the mind. It is in its capacity to represent a (logical, grammatical) system of relations that language is analogous to Mathematics. Language symbolically represents both the relation of mind to the world and relation of human knowledge to divine knowledge. Language reveals the character of the race.

### **Conclusion**

The theories of Piaget, Vygotsky, Chomsky, Skinner, Skemp, Coleridge, etc. debate the profound functions and influence of language. The art of mathematics is lying in its language, which remains uncovered in most of the mathematics classes retains mathematics as a difficult subject in developing and under developed countries.