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VYGOTSKY'S PERSPECTIVE ON CONCEPT DEVELOPMENT IN THE CHILD AND THE ROLE OF INSTRUCTION IN IT

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ABSTRACT

This theoretical paper maps down the process of concept development from Vygotsky's theory of concept formation, the steps involved in the concept formation and the role of instruction in it. Vygotsky distinguished between lower order thinking and higher order thinking and he classified concepts into everyday concepts and scientific concepts. Scientific concepts are higher order cognitive processes as it is learnt by a child in a mediated process, in contrast to everyday concepts which are learnt through everyday experiences. Moreover, he gave the concept of the zone of proximal development and its role in the development of scientific concepts. This paper provides a detailed description of the process of concept development and the role of instruction in it.

KEYWORDS: ***Concepts, everyday concepts, scientific concepts, zone of proximal development***

Vygotsky's psychological ideas have increasingly influenced work in several academic disciplines in the Western world (Werstch,1988). His emphasis is on cultural influences in learning which provides a broad conceptual framework that challenges us to examine the learning and teaching. In his book titled 'Thought and Language' (1962, chap.6 "Development of Scientific concepts") Vygotsky initiated a discussion on the issue which continues to be fundamental importance in education even of the relationship between the development of decontextualized, formal thinking and school instruction.Vygotsky's doctrine of scientific concepts have been extensively applied to education.

Mathematical concepts are typically the type designated by Vygotsky as the scientific concept as they are learned under systematic instruction in school, not by everyday experiences. Mathematical concept development requires a theoretical mode of thought and is abstract; it can't be detected by empirical features like shape, color etc.

THEORETICAL FRAMEWORK

Concept Development : Vygotskian framework

Vygotsky (1986) stated, Concept formation is a higher order mental function, which are mediated processes: 'signs' are the basic means used to master and direct concepts. In concept formations that 'sign' denotes a word, which functions as a means of concept formation. Word becomes the symbol and investigation of the functional use of word and its development from one age to the next provides the key to the formation of the concept. Thinking in concepts is not possible without verbal thinking. Fundamental to formation of concepts, is adults mastery of their own mental process through words or signs.

Concept develops from concrete experiences, where children have to isolate or abstract some general feature from several concrete impressions. The presence of only associative connections is insufficient for the development of concepts. Concept is always productive rather than reproductive and involves the resolution of some tasks. Factors determining concept formation are not association, attention, presence of goal and task , mutual cooperation or judgment or determining tendency. These factors participate in the formation of concepts but none of them are essential or determining process. Development of concepts doesn't occur in linear transition from concrete to the abstract. It proceeds in reverse order from general to particular or from top of the pyramid to its base. Concept evolves in the process of thinking and can be broken down into many separate stages of development where in every stage there is concept in action i.e its functional application to the process of thinking (Vygotsky, 1987, p, 85).

The development of the process that leads to concept formation is present since childhood, but these processes mature only in the transitional age. It is not a quantitative transformation of elementary functions, as the association between the process of development of concepts has something qualitatively new i.e transmission from unmediated intellectual activity to operations that are mediated by signs.

Stages in Concept Formation

Vygotsky conducted an experiment to understand the process of concept formation. He described three stages of concept formation each of which breaks into several distinct phases. These are as follows:

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The **first stage** of concept development can be seen in the behavior of young children when they form unordered collections or heap of objects. This phenomenon can be described as the child's tendency to substitute surplus subjective collection with insufficient objective collections. Children engage in social interaction with adults through words. Meaning of given words intersects for both adult and child on the same concrete objects. But the development path of the meaning of this word is entirely different.

The **first phase** of the **first stage** of concept formation is the **syncretic image**: which means a heap of objects that corresponds with the meaning of words. This is the trial and error period in the child's thinking (Vygotsky, 1962). For example, when a child is required to group together all similar objects (in terms of size, shape or color), the child may group together objects that are lying close together without isolating the individual features of the objects. In this case, the classification is only based on circumstantial or chance phenomenon not on the basis of common underlying features.

The **second phase** is that of the **spatial distribution** of the objects, the syncretic image as discussed above are also formed on the basis of the spatial encounter of isolated elements.

The **third phase** of the first stage is the basis for syncretic image formation and signifies the transition to the second stage of concept formation.

The **second stage** in concept formation is thinking through **complexes**. In this stage, the objects are arranged according to objective connections among different concrete objects, unlike the first stage which was merely based on subjective connections arising in a child's impressions. This stage involves unifications and generalizations of separate objects, which leads to the systematization of a child's experience.

Complex thinking is both connected and objective thinking, the child in this stage of concept formation moves from syncretic image to mastery of objective thinking. Thought in complexes are objective and coherent but still, it does not reflect objective relationship as that of conceptual thinking. The factual bonds underlying complexes are discovered through direct experiences, unlike concepts which are formed on the plane of abstract logical thinking. Thus the complex lacks logical unity. Complex thinking is crucial in terms of the development of conceptual thinking as it helps learners incoherent thinking by isolating different attributes of the object or ideas with specific properties into groups and thus forming the basis for later theoretical generalizations. This thinking occurs in the plane of concrete empirical thinking and conceptual thinking is abstract logical thinking based on abstract logical connections.

Vygotsky classified complex thinking into five different phases: associative complex, chain complex, collection complex, diffuse complex and pseudo concept (Vygotsky, 1962). The **first** type of complex is an associative **complex**, the inclusion of objects in this complex is based on similarity, for example, color, shapes, dimension etc. This complex is always based on concrete experiences. The **second phase** of complexive thinking consists of **collection complex** i.e unification of objects in a collection based on a single feature. The child selects objects to match models on physical features, these selections of objects are neither accidental nor chaotic. The difference between this and the associative complex is that in former there is association by contrast and in latter, there is association by similarity (Vygotsky, 1987, p. 133).

The **third phase** is that of the **chained complex** the object is included in the group because it shares an attribute with another object already in the group. The **fourth type** of complex is **diffuse complex**, because the features that unify concrete elements in the complex are diffuse, undefined collections of concrete groups of images.

This **final phase** completes the picture of complexive thinking. This phase is called **pseudo concept** and it acts as a bridge to the formation of concepts. In pseudo-concept, the generalizations formed in a child's mind appear very similar to the true concept but it's psychologically very different. The unmasked similarities between pseudo-concepts and true concepts are a major obstacle in the genetic analysis of thought. The reason for this is that a child learns the whole series of words which have the same meaning for adults, this helps in communication between adult and child through mutual understanding. This creates an impression that beginning and end stages in the development of a concept i.e the word correspond to a completed concept which is given to a child from society with no role for further development. But child words correspond to adults only in terms of object relatedness, i.e they indicate the same object but don't correspond in meaning (Vygotsky, 1987).

On one hand, as already stated, this similarity between pseudo concept and concept create obstacles in the genetic analysis of thought but this contradiction is of extreme importance in the development of child's thinking. Thus this serves as the final phase of the second stage of concept formation, by serving as a bridge between a child's concrete and abstract thinking.

According to Vygotsky (1962), **the final stage** of concept formation is of **true concept**, it requires abstract thinking, to single out elements and to view the abstracted elements apart from their totality of concrete experience in which they are embedded. In this study, the term mathematical concept is used to refer to the mental idea of the mathematical object. According to Vygotsky's theory of concept formation (1962, 1986), a mathematical idea becomes a concept (rather than a complex)

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when its internal links, i.e., the links between the different properties and attributes of the concept are consistent and logical.

The process of concept formation appears as a movement of thought within the pyramid of concepts, constantly changing between two positions from the concrete (particular) to the abstract (general), and from abstract to the concrete. "The concept is formed as an intellectual operation in which all the elementary mental functions participate in a specific combination. This operation is guided by the use of words, of abstracting certain traits, synthesizing them, and symbolising them by a sign" (Vygotsky, 1962, p. 81). In the whole process of concept formation word is an integral part and word maintains its guiding functions in the whole process .

Development of Scientific Concepts

Vygotsky first introduced the discussion of Scientific Concepts in chapter 6 'Development of Scientific concepts' in 'Thought and Language'. His discussion on 'development of Scientific Concepts' is carried out quite largely in terms of the ways in which they differ from everyday concepts or spontaneous concepts. "Everyday concepts are learned through cultural practice and, because they are tied to learning in specific contexts, allow for limited generalization to new situations, scientific concepts are learned through formal instruction and, because they are grounded in general principles, can more readily be applied to new situations" (Vygotsky, 1962, p. 114).

Vygotsky argues that while spontaneous concepts may be developed without formal instruction, scientific concepts develop from spontaneous concepts under formal instruction (Vygotsky, 1962). Vygotsky valorises scientific concepts as the height of intellectual activity because formal, abstracted knowledge of a concept enables its application to new situations. Spontaneously developed concepts in contrast tend to be situated in the context in which they are learned and are thus less amenable to application to new situations.

The child can consciously use scientific concept, because the development of scientific concepts begin with verbal definition and is used in non spontaneous operations, while on the other hand use of everyday concepts in non spontaneous situations are relatively late, long after the concept acquisition as the child is not conscious of his own act of thought and is not able to operate with everyday concept at will. The examples proving this are when given a reasoning task, children performed better with problems involving scientific concepts than everyday concepts because scientific concepts can be generalized to other situations, while children lack awareness of everyday concepts and can't operate with them at will as the situation demands. For instance, "the concept of 'brother' is saturated with everyday experience, but when asked to solve an abstract problem about a brother's brother, the child becomes confused. On the other hand the child can correctly answer questions based on 'slavery; 'exploitation' or 'civil war" (Vygotsky, 1962, pp 108). Another example is a 3 year old child having experienced that a pin, needle and a coin sinks in water might wrongly assume that all small objects sink in water.

Despite being learnt from direct experience and its unscientific nature, everyday concepts play a major role in the acquisition of scientific concepts, they form the foundation for scientific concepts acquisition as a certain level of understanding of everyday concepts is required for the development of scientific concepts. Vygotsky stated that, "Development of the child's everyday concept proceeds upward, and the development of scientific concept proceeds downward" (Vygotsky, 1962, p.108).

In summary, Vygotsky's doctrine of scientific concepts, in the context of school instruction is an elaboration of his general theoretical views that mediated learning is a major determinant of human development. Vygotsky viewed school instruction as a major process of mediated learning, which will contribute to the development of higher order mental functions in middle childhood. Such a development generating effect of instruction would take place only if the process of instruction is organized in a proper way. For him "the only good kind of instruction is that which marches ahead of development and leads it, it must be aimed not so much at the ripe as much as on the ripening functions"(Vygotsky, 1962, p.104). Properly organized instructions in school lead to the development of 'scientific concepts' that can be contrasted with everyday or spontaneous concepts. Everyday concepts are generalization of everyday personal experiences developed without any systematic instruction. Therefore, such concepts are non systematic and often wrong. Vygotsky used the term "scientific concepts" in a broad sense, which includes concepts in the social sciences, language, and mathematics. According to Vygotsky scientific concepts are systematic, hierarchical knowledge as opposed to the nonsystematic, unorganized, and context bound knowledge gained from everyday experience.

Semiotic mediation in the development of scientific concepts

'Semiosis' is the term used to designate any 'sign' process: the activity of sign. 'Sign' means something that stands for something else. Semiotic is 'the study or doctrine of signs'. Mathematics is full of signs for example, triangle- which is a particular case but used to denote triangles in general (Radford, 2006).

According to Vygotsky (1978), signs are psychological tools which a child initially uses to influence the surrounding environment and then to master his/her own behavior. These psychological tools include written and oral language, numbers, diagrams etc used to communicate cultural knowledge and organize behavior of every individual. The role of signs in psychological activity is analogous to the role of a tool in labor. The most basic difference between sign and tool is the way they orient human behaviour. Sign is both a psychological tool and cultural mediator used for accomplishing a goal.

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> "The tool's function is to serve as the conductor of human influence on the object of activity; it is externally oriented; it must lead to changes in objects. It is a means by which human external activity is aimed at mastering, and triumphing over, nature. The sign, on the other hand, changes nothing in the object of a psychological operation. It is a means of internal activity aimed at mastering oneself; the sign is internally oriented" (Vygotsky, 1978, p. 55).

He gave the concept of "internalization" to describe how the psychological tools transform the lower mental functions into higher mental functions. Vygotsky (1978), states that "all mental functions occur twice in the developmental plane, once in the social plane of development and later in the psychological plane of development". The main function of these psychological tools is to allow certain freedom to the mind from concrete environmental situations, by organizing and constructing higher levels of cognition than animals (Linask, 2012). With the sign using activity an externally oriented activity begins to occur internally and leads to the development of intelligence, voluntary attention and memory.

Thus the term semiotic mediation is paraphrased as "mediation by means of semiosis, that is, by the use of sign systems which act as an abstract tool in changing the character of human mental activity" (Hasan, 2002). Scientific concepts according to Vygotsky were higher order mental functions. Scientific concepts are characterized by conscious awareness, voluntary control and abstract thinking. Voluntary control and intellectualization requires the use of 'artificial stimuli', they are under human control and are required for the manipulation of thinking.

To quote

> "Human beings go beyond the limits of the psychological functions given to them by nature and proceed to a new culturally-elaborated organization of their behaviour. The central characteristic of elementary functions is that they are totally and directly determined by stimulation from the environment. For higher functions, the central feature is self generated stimulation, that is, the creation and use of artificial stimuli which become the immediate cause of behaviour" (Vygotsky, 1978, p. 39).

Role of Instruction in development of scientific concepts

In every ontogenetic stage of development, a child forms meaning with everyday personal experiences called everyday or spontaneous concepts as already discussed above. Also, Vygotsky argued in every ontogenetic stage there are some meanings that child forms within instruction, these meanings are called scientific concepts or non spontaneous concepts. This kind of instruction is of very specific type involving child-adult collaboration, in which the child forms the meaning and adults imitates that meaning as an act of intellectual imitation (Vygotsky, 1987, p. 216). This type of instruction is 'imitation based instruction' which is different from the 'inquiry based instruction'. In addition to this what Vygotsky called instruction does not even require contingent social interaction (Clara, 2016).

Scientific concepts as Vygotsky stated are only developed in the process of instruction and everyday concepts create a potential for the development of scientific concepts under instruction. The relationships between everyday and scientific concepts are that of instruction and development. Vygotsky addresses the problem of instruction and development by focusing on the work a child does at school. He specifically focuses on reading, writing, arithmetic and grammar's impact on the psychological development of a child. He tries to discover the relationship between instruction and development by trying to answer four questions. He states:

> "The most important issues that we were able to address through this research concerned: (1) the maturity of specific mental functions when instruction begins, (2) the influence of instruction on their development, and, (3) the nature and significance of instruction as a formal discipline"(Vygotsky, 1987, p. 200).

To understand the detailed relationship between instruction and development Vygotsky first addressed the issue of maturity of the mental functions when instruction initially begins at school. He used the example of written speech to explain this problem. Written speech is developed usually 6-8 years after the development of oral speech. When the process of instruction initially begins in writing, written speech is not fully developed, it's in the stage of maturing functions. Instruction plays a fundamental role in the development of written speech. Written speech follows a different developmental path than oral speech, it's a more mature and higher order mental function. Its speech in thought, it lacks the material sound which is the most basic form of oral speech.Written speech is more difficult and complex than oral speech, it's directed by intention and consciousness. Vygotsky concluded the difference between oral and written speech by stating: oral speech is spontaneous and involuntary and without conscious awareness while on the other hand written speech is abstract, voluntary and characterized by conscious awareness.

When school instruction begins in written speech, the basic mental functions that underlie it have not yet begun. Instruction depends on the processes that have not yet matured, the process that has just entered the first phase of their development. This could be applied to other domains of basic subjects such as arithmetic and grammar as during the starting of school instruction they are also immature. The child develops these mental functions during the course of school instruction. In fact the immaturity of the required mental functions at the beginning of school instruction is a basic law in the domain of all school instructions.

In addition to this the next problem addressed to understand the relationship between instruction and development, is the

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connection between all the basic subjects taught at school. According to Vygotsky all the basic subjects taught at school have a common underlying mental function. This common mental foundation is that of conscious awareness and mastery of subjects. The child's abstract thinking develops in all the cases. The development of this foundation is the primary goal of all instructions at school (Vygotsky, 1987, p. 207).

The final section explaining the relationship between instruction and development of scientific concepts is that of the role of zone of proximal development(ZPD) in development of scientific concepts. According to Vygotsky, to analyze a child's developmental level the researcher must also evaluate a child's potential level or zone of proximal development level. Actual development level can be evaluated by analyzing the tasks a child can do independently without any assistance. ZPD is the task that a child can do with assistance or with adult collaboration. ZPD has more significance for the dynamics of intellectual development and for the success of instruction than the actual development level. In collaboration the child can't do infinitely more, but just what lies within the imitation of the child's intellectual potential. Imitation is not mindless copying, imitation is of fundamental significance for the psychology of instruction. Imitation means stepping from something one knows to something new. Imitation and instruction plays a major role in the child's psychological development, as they bring out specifically human qualities of mind. This is the significance of instruction for development. It is also in the content of the concept of ZPD. Vygotsky states, imitation is the source of instruction' s influence on development. Children receive instruction in school not on the basis of what they can do independently but on what they cannot do. This is the fundamental characteristic of instruction to help the child do tasks that he can do in collaboration with adults but not independently. Therefore ZPD is a defining feature of the relationship between instruction and development. Vygotsky states:

> "Instruction and development seem to be related in the same way that the zone of proximal development and the level of actual development are related. The only instruction which is useful in childhood is that which moves ahead of development, that which leads it. Instruction is possible only where there is a potential for imitation. This means that instruction must be oriented to the lower threshold of the developmental cycle which has already occurred" (Vygotsky, 1987, p. 210).

Instruction must always march ahead of development for instruction to be most fruitful. Each subject taught in school requires more than what the child is capable of, leading the child to carry out activities that force him to rise above himself. This is always the case with healthy school instruction. Instruction and development are unique to school age as they only begin when the child enters school not before that. Instruction is maximally productive only when it occurs in a certain period of ZPD, Vygotsky called it sensitive periods. For instance, instruction in writing when the child is 4.5-5 years of age is most fruitful as during this stage there is a rich and spontaneous use of written speech not found after that age.

We can conclude the role of instruction in development of scientific concepts by stating that scientific concepts or non spontaneous concepts can only be formed by intellectual imitation. This does not mean that all intellectual imitation or instruction leads to the development of scientific concepts, it can also happen that during instruction the child forms meaning by intellectual imitation which she can form on her own and that is therefore spontaneous meaning. But for Vygotsky spontaneous concepts are of little significance for a child's conceptual development. For Vygotsky the importance of instruction for a child's conceptual development was that the child forms meaning which he is unable to form on her own. This non spontaneous concept or scientific concept is a true concept which leads to development of higher order mental functions in children. Vygotsky analyzed the formation of scientific concepts in school under systematic instruction. He illustrated the role of instruction in the development of scientific concepts by stating the examples of written speech, grammar, arithmetic and foreign language. When the child enters school his mental functions are only maturing in the domains of these subject matter, it is only fully matured under the influence of instruction. All the basic subjects taught at school's aim is the development of conscious awareness and mastery, which is the basic foundation of development of scientific concepts. Thus instruction enables the child to move towards higher levels of possibility, this is called ZPD. For ZPD to be realized the relationship between spontaneous and non spontaneous concepts must be sustained, that is instruction is needed throughout the whole process of realization of ZPD, because during this process the child can form non spontaneous concepts only through instruction (Clara, 2017).

Thus, it can be summarized that instruction pushes the child's conceptual development only if it leads to the development of scientific concepts in relation to the everyday concepts and when this relation is sustained for long enough to permit the mutual self development of scientific and everyday concepts. This answer also clarifies our common understanding of ZPD, ZPD is not merely a relationship between people, but rather a structural relationship between concepts i.e everyday and scientific concepts. As ZPD opens up a child's potential to move from her actual development level to a higher development level. The meaning that constitutes the structural relationship between concepts are formed under acts of learning, within instruction. This structural relationship causes the development of scientific concepts and at the same time scientific concepts restructures the understanding of everyday concepts and the two concepts enter the dynamics of mutual development. This relationship is the unit of self development that is what Vygotsky was looking for to explain cultural development (Clara, 2017). This self development is achieved as scientific concepts allow for

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conscious awareness and better reasoning which everyday concepts do not. Vygotsky argued that the mutual self development of everyday and scientific concepts under instruction is a law and this is the law of interconnections between higher systems(scientific concepts) and lower systems(everyday concepts) (Clara, 2017).

CONCLUSION

This theoretical paper has mapped down the process of concept development from Vygotsky's theory of concept formation, the steps involved in the concept formation and the role of instruction in it. He gave three stages of concept development: Syncretic image, thinking in complexes, and true concept stage.

He distinguished between everyday and scientific concepts and stated that while everyday concepts may be developed without formal instruction, scientific concepts develop from everyday concepts under formal instruction (Vygotsky, 1962). Vygotsky valorises scientific concepts as the height of intellectual activity because formal, abstracted knowledge of a concept enables its application to new situations. Spontaneously developed concepts in contrast tend to be situated in the context in which they are learned and are thus less amenable to application to new situations.

Scientific concepts are developed in the process of instruction and everyday concepts create a potential for the development of scientific concepts under instruction. The relationships between everyday and scientific concepts are that of instruction and development. Vygotsky's doctrine of scientific concepts, in the context of school instruction is an elaboration of his general theoretical views that mediated learning is a major determinant of human development. Vygotsky viewed school instruction as a major process of mediated learning, which will contribute to the development of higher order mental functions in middle childhood. Properly organized instructions in school lead to the development of 'scientific concepts' that can be contrasted with everyday or spontaneous concepts. Everyday concepts are generalization of everyday personal experiences developed without any systematic instruction. Therefore, such concepts are non systematic and often wrong. Vygotsky used the term "scientific concepts" in a broad sense, which includes concepts in the social sciences, language, and mathematics.

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