THE THEORY OF JEAN PIAGET

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The theory of learning advanced by Piaget is cognitive in nature and emphasizes the constructivist aspects of intellectual functioning. From Piaget's viewpoint, an organism's response is always constructed, in part, according to determinants that are intrinsic to its own structure. Development and evolution are seen as intrinsic characteristics of the biological knowing process and not as external events. Knowledge is thus not static but dynamic; it is neither solely in the subject nor in a supposedly independent object, but is constructed by the subject in a subject-object relationship. For Piaget, an object is not an object of knowledge until the knowing organism interacts with it and constitutes it as an object.

Intelligence

Piaget offers several general definitions of intelligence, including: "the instance of biological adaptation"; "the form of equilibrium toward which all cognitive structures tend"; and "a system of living and acting operations".[1] Piaget does not stress individual differences in intelligence; although he recognizes differences in intellectual ability, he is not interested in this analysis, but rather in a description of the general form of thought.

Little emphasis is placed on emotion, although Piaget states that no act of intelligence is complete without emotion. Emotions represent the energetic or motivational aspect of intellectual activity. He further postulates that external reinforcement has little effect on real learning, and that much of the child's development involves self-regulation.

Piaget's view concerning language is in strong contrast to Pavlov's second signal system. While not denying that language is an importnat human acquisition, Piaget feels that logical thinking derives from action and is primarily non-linguistic. Correspondingly, Piaget believes

[1] J. Piaget, *The Psychology of Intelligence* (New Jersey: Littlefield, Adams & Co., 1966), 3-4.

that knowledge cannot be given to a passive observer; knowledge of reality must be discovered and constructed by the activity of the child. This assertion contradicts the mechanistic, behavioristic view.

Piaget states that, even in the first few days of life, the infant seeks stimulation. Behavior cannot be explained as an attempt to escape from a noxious state of affairs; this belief is in contrast to Hull's drive-stimulus reduction theory.

Piaget views intelligence in terms of content, structure, and functioning. Most of Piaget's career was concerned with the study of the structures and functions of intelligence, since he sought to discover the basic processes underlying the determination of content rather than mere description of the content of thought.

Structures

Hereditary Structure: Inherited physical structures both permit certain intellectual achievements and prohibit others. For example, while the human eye enables three-dimensional perception, it is not equipped to permit underwater sight. Automatic behavioral reactions (reflexes) are also transmitted genetically. Piaget feels that, in the case of human intelligence, reflexes and other automatic behavior patterns play only a minor role. Only the infant's behavior is heavily dependent on these elementary behavioral structures.

Psychological Structures: Psychological structures, forming the basis of intellectual activity. These structures are the product of complex interaction between biological and experiential factors.

Functioning

All species inherit two basic tendencies or "invariant function": Adaptation and organization. Organization refers to a tendencty to systematize or organize processes into coherent physical or psychological systems. Adaptation consists of two complementary processes, assimilation and accommodation. Assimilation refers to dealing with the environment in terms of one's current structures, while accommodation refers to the tendency to change in response to environmental demands. These two processes are simultaneously present in every act. While organization and adaptation are inherent, they are not structures but tendencies. The particular ways in which an organism adapts and organizes its processes depend also on its environment.

Developmental Theory

Piaget's theory is developmental through its emphasis on age-related qualitative differences in intellectual functioning. Mental development occurs in a succession of four periods: (1) Sensorimotor (birth to two years); (2) Preoperational (age two to seven); (3) Concrete operational (age seven to eleven); and (4) Formal operational (age eleven and older). Each stage extends preceding one, reconstructs it on a new level, then subordinates it within a more complex structure.

A few cautions regarding the above developmental stages seem warranted. First, the age norms for each stage are only approximate, and many individual differences will exist as a result of differential environmental effects; however, the ordering of levels is invariant. A child cannot skip a level entirely, for the acquisitions of each stage lay the groundwork for skills to be learned at the next level. Furthermore, even though separate levels are differentiated, development is viewed as a gradual and continuous process; the child does not jump suddenly from one level to another, but undergoes a much more gradual transition. Also, development is not always consistent across all spheres of behavior. Finally, behavior characteristics of a given stage do not completely disappear when a child reaches the next stage. Even though new abilities are added to the child's repertoire of behavior, he nevertheless retains and exhibits skills acquired at earlier stages.

The concept of conservation is central to Piaget's theory. As used by Piaget, "conservation" refers to the invariance of a particular dimension of empirical objects throughout observed changes of state. From a total lack of consevation in the infant, this ability gradually develops until a highly abstract form of conservation is acquired and solidified in adolescence. The stability of operational thought is dependent upon five conservation laws, which are summarized as follows:

1. Combinativity--any two classes may be combined into a comprehensive class that includes both;
2. Reversibility--any given mathematical or logical operation may be cancelled by its inverse operation;
3. Associativity--the combination of several operations without regard for any particular sequence of combinations;
4. Identity--any operation can be nullified by combining it with its opposite operation;
5. Logical classes
   a. Tautology--classification or relation which, if repeated, is not changed;
   b. Iteration--a number combined with itself produces a new number.[2]

These aspects of conservation can be readily observed in the developing child, as they assist in organizing his or her perception of various stimuli.

Musical Intelligence

The term "musical intelligence" implies that the intellectual processes play an important role in musical learning. Piaget's theory of intellectual development is thus applicable to development in the field of musical perception. In order to understand music, concepts of melody, harmony, rhythm, and form must be learned. Consequently, musical learning begins with perception of the sound structure, and continues with the development of those musical concepts which permit organization of what is heard. In a temporal structure such as music,

[2]Marilyn Pflederer, "Conservation Laws Applied to the Development of Music Intelligence," *Journal of Research in Music Education*, XV (1967), 217.

therefore, Piaget's conservation laws may operate on a more concrete level than in other structures.

According to Pflederer, musical concepts are the source of musical understanding. As musical thought develops, the organization of the conceptual musical framework is enhanced through conservation of tonal and rhythmic patterns. Pflederer has identified "conservation" type laws that might be operative in the development of musical concepts:

1. Identity--maintaing the essential characteristics of thematic material;
2. Metrical groupings--the temporal unit becomes invariant in the child's thinking;
3. Augmentation and Diminution--this process involves a reversible operation because the individual must go back to a different representation of the unit beat before making a time judgment that a given melody has been played twice as fast or slow the second time;
4. Transposition--a melody remains invariant when it is transposed to a new key if its intervallic relationships are maintained;
5. Inversion--substitution of higher notes for lower tones and conversely.[3]

These five "conservation" laws are operant as the individual begins to organize musical perceptions into a conceptual framework, becoming increasingly complex as the child grows in maturity and experience.

Piaget's Theory: Implications for Education

The concept of intellectual development has already supplanted the idea that the child is simply a miniature adult. The child has a distinctive mental structure which is qualitatively different from that of the adult, and what is meaningful to a teacher is not invariably meaningful to the child. The educator must therefore attempt to understand the child's unique experience and modes of thinking.

According to Piaget, a child's understanding may be viewed in terms of three levels. At the level of motoric understanding, the child can act directly on objects and manipulate them correctly. From this, the child moves to the level of internal activity on an intuitive basis. Since activity can be performed much faster on a mental than on an overt level, the child can do more in a given period of time--he or she is no longer limited by spatial and temporal restrictions. At the highest level, that of verbal understaning, the child is able to deal with concepts on an abstract verbal level, and can often verbally express mental operations.

These three levels are hierarchical in nature, so one must master each level before advancing to a more complex stage; however, these different levels are not necessarily restricted to given ages. At a given period of development, one mode of understanding predominates but does not exclude the other levels. In order to be effective , a teacher must be aware of the child's current level of understanding and present learning experiences which correlate with this level of comprehension.

[3]Ibid., p.221.

An obvious conclusion from an examination of these levels of understanding is that concrete experience should precede learning from verbal explanations or written materials. According to Piaget, when teaching is only verbal, the result may be superficial learning. The skillful teacher should encourage the child's activity through manipulation and exploration of objects, in addition to verbal and written education.

Piaget consistently emphasizes the interaction of current cognitive structures and new experiences to arouse interest and develop understanding. Interest and learning are facilitated if the presented experience is relevant to what the child already know but, at the same time, is novel enough to present incongruities and conflicts. This theory is analogous to the familiarity curve often applied to musical situations. In order to command full attention and provide for optimum learning, music must be novel enough to gain the child's attention, but cannot be so radically novel that it is unassimilable into the child's current cognitive structure.

Another implication of Piaget's principles is that the classroom must be oriented more toward the individual than the group, for a given task or lesson may not arouse the interest of or promote learning in all class members. This implication is especially important at the elementary level of education, before conservation is fully established and consolidated. In music, individualized instruction can be accomplished through the use of music listening stations, interest areas, and teaching machines. Through use of such methods, children will derive maximum benefit from their educational experiences.

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