

Cognitive Development in Jean Piaget's Work and its Implications for Teachers

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Abstract: This paper reviewed definitions for four concepts related to the central concept of sociability (social cognition, social competence, social skills and social behavior). Cognitive psychologists have begun to address how motivational factors influence adults' performance on cognitive tasks. However, little research has examined how different motivational factors interact with one another to affect behavior across the life span. Jean Piaget (1896-1980) was a biologist who originally studied molluscs (publishing twenty scientific papers on them by the time he was 21) but moved into the study of the development of children's understanding, through observing them and talking and listening to them while they worked on exercises he set. His view of how children's minds work and develop has been enormously influential, particularly in educational theory. His particular insight was the role of maturation (simply growing up) in children's increasing capacity to understand their world: they cannot undertake certain tasks until they are psychologically mature enough to do so. His research has spawned a great deal more, much of which has undermined the detail of his own, but like many other original investigators, his importance comes from his overall vision.

Key words: Cognition • Assimilation • Accommodation • Schema • Egocentrism

INTRODUCTION

According to standard college dictionary cognition refers to the act or faculty of knowing or perceiving. Cognition is a general term or a "generic term used to design all processes involved in knowing." According to Hilgard [1] cognition comprises all mental activity or states involved in knowing and the mind's functioning and include perception, attention, memory, imagery, language functions, development processes, problem solving and the area of artificial intelligence.

Development as a term implies qualitative change and it is applied to those innate potentialities that change and grow under the influence of the environment. The study of cognitive development concerns changes with age in relation to the system of what we know and changes in the way in which that system interacts with other facets of behavior. There are three views about the development of a child. According to Turner [2] these views are:

"Firstly, the child can be viewed as an organism which grows almost like a plant, with the implication that it contains within it the seeds of adulthood..... Alternatively the child can be thought to bring nothing with him beyond a set of reflexes so that what he becomes is a reflection of what has happened to him. A third view in the cognitive development is thought to be affected by the environment and yet to be able to determine to an

extent those aspects of the environment to which he will respond." She further defines the term cognitive development as, "the development of a set of fundamental processes not the acquisition of any specific pieces of knowledge or information." In the view of Diggory [3] "The term cognitive development refers generally to changes in thinking abilities." And according to Piaget [4], "Cognitive development is neither the result of the maturation of the organism, nor of the influence of the environment alone, but of the interaction of the two." From these definitions of cognitive development it becomes clear that this is the development of the process or processes by means of which an individual is able to acquire knowledge.

In any Education system teacher occupies pivotal position. It is said that no system of education is better than its teachers. The teacher is the kingpin in the entire educational, set-up. The chief function of the teacher is to impart knowledge among his students and to provide adequate and meaningful experiences to them so that they achieve an all-round development of their potentials. This is possible only when teachers will know and understand the nature of the growth and development of learners and the learning process. According to Crow & Crow [5], "What a child learns and how well he learns depends upon his existing stage of maturation - his readiness to learn."

Significance of the Study: The study will be helpful to classroom teachers to understand:

- The current mental abilities of their students.
- The previous knowledge of their students.
- How to plan, organize and develop the instructional activities for further development of the students.

Objectives of the Study: The purpose of the study was to draw attention of classroom teachers towards the cognitive development in Jean Piaget’s work and its implications in instruction. Therefore the objectives are:

- To provide material to classroom teachers about the stages of cognitive development of their students.
- To help classroom teachers in the implication of Jean Piaget’s development stages to their teaching.

Delimitation of the Study:

- The study is limited to the all four stages of cognitive development of Jean Piaget only.
- The implications are limited only to classroom teachers of Pre-primary, Primary and secondary school only.

Methodology: The library reference technique of descriptive type of research methodology was used in the study.

Review of the Related Literature: For the convenient, the study is alienated into:

- Jean Piaget and his work.
- His development stages (study),
- Implication for the teachers.

Jean Piaget and His Method of Study: The first unavoidable personality to be referred for this study would be Jean Piaget. He is the psychologist who has

studied child development during the first half of the twentieth century. He was born in Neuchatel, Switzerland in 1896. At the age of ten he published his first “scientific paper” based on observations of the part-ability, but also of his future work i.e. observation. It is impossible to evaluate his contribution to the study of child development in a limited space, because he has written more than 25 books and 150 articles. In this article, however, the major target to be achieved would be to know how do the children of the “Cognitive developmental approach. He is concerned with the qualitative changes which take place in a person’s mental make-up between birth and maturity.”

His method of investigation has been the clinical approach; detailed face-to-face discussion and questioning of individual children in problem situation. It aims to discover, the quality and nature of children attainment at a particular time in their lives. The work has led to a descriptive analysis of development of basic physical, logical, mathematical and moral concepts from birth, to adolescence.

Lamax [6] summarizes the work of Piaget in these words: “Piaget’s work on children’s thinking fall into three main phases:

- His early work used the verbal clinical method.....
- His second series of researches carried out in the 1920’s and 30’s were based on observation of his own three children... and.
- His later and the most influential research are concerned with the logical and mathematical concepts such as number space and time.

His Developmental Stages: Before stating the development stages it will be useful to discuss the basic concepts in Jean Piaget’s work.

Adaptation	What it says: adapting to the world through assimilation and accommodation
Assimilation	The process by which a person takes material into their mind from the environment, which may mean changing the evidence of their senses to make it fit.
Accommodation	The difference made to one's mind or concepts by the process of assimilation. Note that assimilation and accommodation go together: you can't have one without the other.
Classification	The ability to group objects together on the basis of common features.
Class Inclusion	The understanding more advanced than simple classification, that some classes or sets of objects are also sub-sets of a larger class. (E.g. there is a class of objects called dogs. There is also a class called animals. But all dogs are also animals, so the class of animals includes that of dogs)
Conservation	The realization that objects or sets of objects stay the same even when they are changed about or made to look different.
Decentration	The ability to move away from one system of classification to another one as appropriate.
Egocentrism	The belief that you are the centre of the universe and everything revolves around you: the corresponding inability to see the world as someone else does and adapt to it. Not moral "selfishness", just an early stage of psychological development.
Operation	The process of working something out in your head. Young children (in the sensori-motor and pre-operational stages) have to act and try things out in the real world, to work things out (like count on fingers); older children and adults can do more in their heads.
Schema (or scheme)	The representation in the mind of a set of perceptions, ideas and/or actions, which go together.
Stage	A period in a child's development in which he or she is capable of understanding some things but not others

Stages of Cognitive Development

Stage	Characterized by
Sensori-motor (Birth-2 yrs)	Differentiates self from objects Recognizes self as agent of action and begins to act intentionally: e.g. pulls a string to set mobile in motion or shakes a rattle to make a noise Achieves object permanence: realizes that things continue to exist even when no longer present to the sense (pace Bishop Berkeley)
Pre-operational (2-7 years)	Learns to use language and to represent objects by images and words Thinking is still egocentric: has difficulty taking the viewpoint of others Classifies objects by a single feature: e.g. groups together all the red blocks regardless of shape or all the square blocks regardless of colour
Concrete operational (7-11 years)	Can think logically about objects and events Achieves conservation of number (age 6), mass (age 7) and weight (age 9) Classifies objects according to several features and can order them in series along a single dimension such as size.
Formal operational (11 years and up)	Can think logically about abstract propositions and test hypotheses systematically Becomes concerned with the hypothetical, the future and ideological problems

Stages of Senory-Motor Period

Stage one (0-1 month):

- Innate reflexes begin to function, e.g. sucking of nipples.
- Non-functional exercises of the innate reflexes strengthens the innate schema and prepare for their later consolidation e.g. the infants sucks on nothing or sucks on object other than a nipple like, thumb, blankets etc.

Stage two (1-4 months):

- Repetition of innate behaviour continues which results in strengthen of innate schema without any purpose only for their own sake e.g. thumb sucking and fingering blankets.

Stage three (4-8 months):

- Secondary circular (not innate) actions develop and child manipulates objects.
- The actions are acquired through the consideration of schemas.
- Repetition of actions is due to interesting stimuli not of own sake.

Stage four (8-12 months):

- The next step is practical intelligence. In some respect this stage is like last.
- Existing schemata are consolidated and expanded as the infant adapts to new situations.
- Self and world are no differentiated. Infant solve problem through the application of existing schemes to new situation.

Stage five (12-18 months):

- Tertiary circular reactions develop. These reactions allow the infant to create new behavior. These behaviors are best described as “directed groping”
- The child’s behavior is intentional. The child explores the environment.
- By the end of stage five, the infant is progressing toward mental representation.

Stage six (18-24 months):

- The transition from overt to covert representation occurs at the stage.
- The child can reproduce from memory and use symbols to refer to objects not present.

Pre-Operational Period (2 to 7 Years):

The period of pre-operational thought is divided into two stages.

- Pre-concept ional thought, which occurs at approximately two to four years of gage.
- Intuitive thought, which appears about age four and lasts until the concrete operational period.

During this Stage:

- The child’s concerns are associated with the developments of language.
- The first action from action to thinking is the internalization of action.
- Pre-operational children are incapable of reasoning inductively or deductively.
- His thinking is irreversible because he is not capable of performing mental operations.

- The children cannot reason about his thinking. He is incapable of analyzing, synthesizing and evaluating thought.
- Egocentrism is the degree to which a child views himself as the center of reality. Pre-operational children are quite egocentric.
- The child's conception of world continues to expand during the period. The concept of object permanency, time (past, present and future), space (immediate area) and causality expands.
- He may count the number but does not comprehend the meaning of cardinal and ordinal numbers.
- Inanimate objects such as sun and the clouds are endowed with human attributes.

The Concrete Operational Period (7 to 11 Years):

The period begins for most children around age seven and terminates at eleven. It is called concrete because children's thought is restricted to what they encounter through direct experience. They think about existing objects and properties (e.g. weight, color and texture) and they think about the actions they can do with these objects. This is really first reasoning stage. The word operation is Piaget's term from probably 'logic'. He means that the child is capable of thinking over actions, which previously he had overtly and is reversible.

At this stage children develop reasoning strategies such as:

- Classifying in various ways, grouping things into a class or subclass.
- Doing one-to-one correspondence.
- Reversing thought process: $A \rightarrow B$ and $B \rightarrow A$.
- Performing mathematical operations: adding, subtracting, substituting, multiplying, dividing and ordering in space and time.
- One of the most important acquisitions in the development of operational thinking is that of conservation, but it is important to note that conservation achieved is applicable to concrete objects only.

The Formal Operational Period (11 to 15 or 16 Years):

The fourth and final stage that of the formal operational period starts around age 11 and involving improvements in abstract thinking goes to about age 16. Piaget believes that these operations are initiated through co-operation with others. Piaget observes:

“as far as intelligence is concerned, co-operation is thus an objectively conducted discussion.... It is clear that co-operation is the first of a series of forms of behaviour which are important for the constitution and development of logic” [7].

- At the level of formal operations, all the earlier characteristics of operations continue in force.
- Formal thinking is reversible, internal and organized in a system the parts of which depend on each other.
- The focus thinking shifts so that real situation that is experienced is seen as only one of many different possible situations.
- At the formal level of operations, individuals can reason hypothetically and in the absence of material evidence they set up hypothesis and test these to determine real solutions to problems amongst a number of possible solutions. This is known as hypothetical-deductive reasoning.
- Students are aware of inconsistencies and mistakes due to the use of mental checks and balances reflective thought.
- Students can establish their own plans for long and detailed projects if given aims and goals.

As the child passes from one stage to another, his schemata change through accommodation to new experiences. At each stage he tries to assimilate new experiences to his existing schemata, but often finds discrepancies.

Implication for Teachers

Sensori-Motor Period: Though there is not direct implication but as a teacher it is important to understand that there is a basic tendency towards continued development in infants.

- Infants progress through six stages of development.
- Infants at the same chronological age may different their behavior and understanding.
- Developments result from an interaction between the infants and their environment.
- Infants should be stimulated through objects and events, for this facilitate the continual transformation of basic structures.
- Infants should be allowed to explore their world, for their actions contribute to their construction of reality.

Teaching the Preoperational Students

Teachers must Keep in Mind That: The really years, being those in which the child gains the experiences, which form the whole basis of future logical thinking and failure to capitalize on these periods may lead to difficulties at the later stages. Therefore, the fundamental function of pre-schools should be as the facilities of the transition from sensory motor intelligence to operational intelligence. Piaget describes this transitional stage as the preoperational period, at time when the young child begins to systematize his physical and social knowledge, to construct logical structures and social knowledge, on representational level. Therefore early education should provide the foundation for later learning, this is an optimal period in the child's life for certain kinds of learning and failure to capitalize on this period may lead to difficulties at the later stages. In the words of Stone [8], "Younger children are much likely to be dependent upon direct contact with phenomenon in their attempt at reasoning than are adults and the visual aspects of things as likely to exert much greater influence on their learning."

For teaching these students a teacher may take guidance from the following:

- Make sure that children manipulate and group objects.
- Involve students in activities requiring social interaction.
- Create activities where students need to know which is, for example, which is taller, bigger, wider, heavier, or longer.
- Give students opportunity to play with brush and paints, along with pencils to draw lines or pictures, which will develop aesthetic sense in the pupils.
- At the intuitive level young children are not able to deal with more than one property of an object or the situation, so the objects given must be accordingly.
- Use concrete objects and visual aids to illustrate the lesson; it will help the students to understand the topic.
- These concrete objects and visual aids may be physical demonstration and drawing and illustrations.
- Use the actions as well as words for explaining.
- Make instructions relatively short.
- As the students at this level are egocentric, so let them experience themselves instead, to see world from other's eyes. These physical experiences will seem as building blocks for later development.

- Give students' material like clay, plastering, water or sand (which can change shape) to play and make different shapes, things from the same amount to understand the concept of conservation.
- To build/develop vocabulary at the stage give students words to describe their experiences (they are seeing, doing, touching, tasting and smelling).

Teaching Concrete Operational Children: To teach from preschool to primary, knowledge of the thinking process at the concrete operational level will be helpful:

- Continue any preoperational activity that is relevant for the children in this age group.
- Encourage students to discover concepts and principles to assimilate and accommodate on their own.
- Involve children in operational tasks such as adding, subtracting, multiplying, dividing, ordering and seriating preferably in concrete ways there they utilize objects.
- Give opportunities to classify and group object ideas on increasingly complex levels.
- Ask students to deal with no more than three or four variables at a time [9]. For doing so, ask the students to perform experiments with a limited number of steps.
- Use familiar examples to help explain more complex ideas so students will have a beginning point for assimilating new information.
- Present problems, which require logical, analytical thinking to solve.

Teaching the Formal Operational Students: Teachers of six and seven classes have the students who are in transition to the formal operational period while teachers of IX to X may have students who are already at the formal operational period. We believe that subject matter content has "cognitive loading", that is certain content may be using only concrete operations, specially when new topic is introduced learning should begin with concrete experienced or children's own experiences even in the case of the most able pupils [10].

- Teaching at middle and upper level school should begin from concrete considerations, building up, where applicable, to more abstract reasoning.
- The lectures and reading should be brief and well organized.

- For assimilating new information teacher should use familiar examples to help explain more complex ideas.
- It is the time when teacher can develop problem-solving approach in their students. At this stage ask students to be in pair or group of four or three, when can give any problem of their standard.
- Teacher should provide time for maturation and activities with physical experience. Allow social interaction and when you teach concepts, model formal patterns of reasoning.
- At this stage hypothetical thinking being so the teacher must give an opportunity to explore many hypothetical questions by discussing\asking questions about social issues or about “other worlds”.
- Have the students establish classification systems.
- Plan the activities to achieve the learning purpose, decision, value, understanding and insight according to the level.

One can say without hesitation that no teacher can perform his work without knowing the cognitive development of the children whom teaching.

A teacher must know the following two points before planning the teaching:

- The current cognition level of the children, he is teaching. This is the question of readiness and.
- Perhaps even more important one, you know the abilities of the children, what teaching strategies should be used? [11].

CONCLUSION

After Going Through the Study it Has Concluded That: About the Developmental Stages

- There are four stages of cognitive development in children; Sensori-motor, Preoperational, Concrete and Formal operational period.
- Each stage is identified by its own characteristics.
- The developmental stages are more closely related to the mental age than the chronological age.
- Level of achievement of each stage is different in different children due to individual differences and environmental condition.
- Though appearance of the characteristics of stages might be at different time but the sequence of the stages remain same.
- The child or adult may operate at one level at one concept and at a higher or lower level for another.
- Thinking of a child might be characteristics of the stage.

About the Implications for the Teachers

- The child does not think like an adult.
- At the same chronological age children might have different level of cognition.
- For fixing the period of the stage, the same group of children should be tested in different kinds of concepts.
- Lesson must be planned by keeping in view the individual cognition level of the students.

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