CHAPTER 2
CONCEPTUAL FRAMEWORK OF THE STUDY-II

(Cognitive Abilities)

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2.1 INTRODUCTION

Child development is the process that governs the appearance and growth of children's physical structures, psychological traits, behavior patterns and ways of adapting to the demands of life. Professionals like psychologists, educators, anthropologists, sociologists, nurses, medical researchers and many others are interested in this process. Development occurs across many dimensions simultaneously—physiological, cognitive, personality, social, emotional and behavioural. Development is spurred on by internal factors, such as the genetic code, and external factors, such as learning and nutrition. The changes brought on by development are both quantitative and qualitative. Words “Growth” and “Development” are used by many people interchangeably as synonyms but there is some difference between these two words. Growth is usually used to refer to changes in size or quantity, whereas development also refers to changes in quality. In other words, development includes growth but not vice versa. In the title of the study, “growth and development” is used in a natural course, as a routine.

Why “child development” should be studied. Here are some causes for studying it:

- the desire to learn about things that are little understood i.e. curiosity
- to try to gain insight into our basic nature

This helps to determine which theoretical perspectives are supported by the evidence. The major theoretical perspectives on child development today are the maturational, psychoanalytic, learning-theory, cognitive-developmental, and ecological perspectives.

- to try to gain insight into the origins of adult behaviour

This aspect deals with the following things:

It explains the origins of empathy in adults and antisocial behavior, the assumption of “masculine” and “feminine” behavior patterns, and the origins of
special abilities in language (reading, writing, spelling, articulation) and in mathematics.

- to try to gain insight into the causes, prevention, and treatment of developmental abnormalities and problems, such as autism, child abuse, hyper-activity, dyslexia, etc
- to try to optimize the conditions of development for all children

Issues like the effects of "open education", as compared to traditional education, on the academic achievement and personalities of children, the effects of bottle-feeding versus breast-feeding on mother-infant attachment can be taken up as a child development study. The present study would throw light on various variables—academic achievement, memory, number of siblings, the birth order, SES (socio-economic status) of parents etc. which would be having effect on the cognitive development of tribal pupils of grades I to IV in Gujarat state.

2.2 COGNITION

Cognition refers to the mental activity and behavior through which knowledge of the world is attained and processed, including learning, perception, memory and thinking. It involves all processes by which sensory input is transformed, reduced, elaborated, stored, recovered and used.

In fact, cognition stands for all the processes involved in apprehending environmental stimulations encountered by the organism. Its aim has been to understand the ways in which individuals take in, code and store information about their encounters with other events at the later time, and finally, to understand the inter-relationships between interactions with events and changes with cognitive structure.

Cognition, then, is a process of gaining information and understanding the world. Cognition in the simplest term is to become aware of something. It is derived from the word "cognize" which means to know something about the world around. Something may be a stimulus coming from our own body or
from outside the environment. In knowing the world, the processes involved are perception, recognition, retention, imagination, meaning, association, attitude, concept-formation and problem-solving, etc. The word cognition has been defined in many ways. While some psychologists define cognition as the process of gaining information and understanding of the world, others define cognition as the process of receiving and dealing with concepts, analysing and synthesizing, deciding and theorizing. As a general term, it covers all the various modes of knowing, perceiving, remembering, imagining, conceiving, judging and reasoning.

Cognition is the act of knowing. The analysis of the act and its components has become the core of psychologists' and educators' attempts to understand the mind. Cognition is a troublesome term in psychology, because it has no clear referent. It has been defined so narrowly as to refer only to "awareness" by Guilford and so broadly by others as to include all higher mental processes (perception, thinking, attention, language, reasoning, problem-solving, creativity, memory, and intelligence). Even though the term cognition was not used until the early 1960s, it is still fair to say that the concern of psychology has always been about cognition.

As Neisser points out,

The fact of computers gave psychologists reassurance that cognitive processes were as real as the muscular and glandular responses that comprised behaviors. Although the mind as a computer metaphor nourished theories of cognitive psychology, the empirical need to support these theories with precise measures of the flow of information through the mind generated new research techniques and paradigms. These techniques coupled with models of the mind as an information processor, constitute the approach to the science of the mind known as cognitive psychology.

Many people consider cognition and intelligence to be synonymous. They are, of course, not synonymous. But they have similar meanings. Even Piaget's conservation tasks also measure the level of intelligence. The old idea that it is a singular entity is no longer tenable, the plurality of the concept has been recognised. This acknowledgment that intelligence is polysemous, and obviously
social in origin, leads naturally on to studying the social representations of intelligence. In fact, a change in our perspective today is essential; we need to stop thinking of intelligence as a quality possessed by individuals, in varying degrees, and recognise it for what it actually is: a value-judgement, a label, slapped on everybody who happens to have (or not to have) the characteristics regarded as typical of an intelligent person Irvine and Berry observed.

Central to our argument is the proposition that Spearman's law of positive correlation among all intellective tasks has to be reconciled with Ferguson's law of cultural differentiation. Ferguson's law predicts differences in human performance that are functions of ecological press to learn skills and strategies of adaptation. We consider the definition of ability to be incomplete without accounting for cultural and biological differences; and we judge the systematic analysis of the data we have at hand to be a major requirement in that definition.

The law of cultural differentiation has been lucidly explained by same authors.

This variation between groups, whatever the nature of the group chosen by the experimenter, has become a seductive constant in almost a century of research. If not quite as important an aspect of intelligence theory as Spearman's law of positive correlation within groups, it has persisted for just as long. We consider that the consistency of the law of positive correlating within groups, and the ease with which between-group differences can be observed post hoc or created experimentally, point to a number of causes operating within a general law of nature. We propose to call this the law of cultural differentiation, or Ferguson's law, after its statement in general form in Ferguson's (1956) essay on transfer and the abilities of man: Cultural factors prescribe what shall be learned and at what age; consequently different cultural environments lead to the development of different patterns of ability.

2.3 COGNITIVE DEVELOPMENT

The term cognitive development first appeared in the psychological or educational literature in early 1960s. By 1970, it had become one of the principal ways psychologists, particularly developmental psychologists, organized their discipline. The term refers to the changes in the act of knowing that occur
throughout the human lifespan. Whether all the changes in knowing are developmental remains a matter of debate between developmental theorists, but there is consensus that the changes in the cognition to which the term refers should be stable and occur over relatively long periods.

The most primitive, yet essential, kind of scientific law merely states how a behavior or event varies with time. Until quite recently the field of cognitive development consisted, almost exclusively, of such laws and relationships. In these, such cognitive variables as the number of words the child knew, the number of digits he or she could recall, or the child’s susceptibility to visual illusions, or his or her knowledge of some subject matter domain (ethics, physics, arithmetic) or his or her reasoning competence, and so forth were plotted as a function of children’s ages, yielding age norms for every conceivable mental ability and achievement.

2.4 THEORIES OF COGNITIVE DEVELOPMENT

The theories of cognitive development divide themselves along two lines—those focussing on differences in what factors or types of causes provide a complete and adequate account of cognitive change and those centering on differences in the factors or mechanisms with which each theory endows an organism so that it will end with a human mind. Aristotle identified four types of causes or determiners. His analysis, ancient as it is, provides a useful way to distinguish the two principal models of human development. To know and understand an event or object completely (the so-called mechanistic model) requires the specification of the first two causes while the other model (the so-called organismic model) requires, in addition, the specification of the third and fourth causes. The four causes, traditionally, have been labelled as: (a) the material cause: the substance out of which the thing is made, (b) the efficient cause: the agent which made the thing happen or which caused it in the usual sense of the word, (c) the formal cause: the form or structure of the thing, that which makes it a this or a that, (d) the final cause: the purpose, significance, meaning, or final end of the thing.
Thus to explain or know any cognitive change, "it is necessary to determine the underlying muscular, glandular, neurological activities which comprise it (material cause), the environmental events which stimulate, trigger, and modify it (efficient cause), the name of the change in so far as the name identifies a structure or pattern (the formal cause), and its purpose or how it fits in with everything else (the final cause)."\(^7\)

Psychologists primarily have restricted themselves to the determination of the efficient cause. These are those which are thought as the stimuli which cause eliciting the responses and maintaining them there after. They speculate also about formal causes while leaving the search for material causes to other disciplines like Biology, Philosophy or Theology. Many times besides the specific responses, one gets opposite responses which are really the same response. The responses are the same because they have the same form, same structure. This is known as formal cause. In intellectual task also, like the Piagetian conservation task, it is often the case that opposite responses may in fact indicate the same underline intellectual structure, operation or scheme.

Although many scientists argue that the consideration of final cause has no place in science, in cognitive psychology it has relevance for making the phenomena intelligible. In cognitive psychology certain features of early development make more sense when viewed from the perspective of what comes after them and what they lead to.

The field of cognitive psychology, like other parts of psychology, is divided upon the question of whether final causes, even formal causes, are a legitimate, nonparsimonious part of psychology. The conservative position is that an adequate discipline can be based solely on the specification of efficient causes. "Theories in this tradition as has been noted, are often viewed as mechanistic (e.g., Skinner, Bandura), while those that demand consideration of the full range of Aristotelian causality have been termed organismic in the sense that an individual behavior can only be understood as part of a system, as part of a totaling of the
organism's behavior (e.g. Werner, Piaget) and all other organisms with which it interacts. There exists an ecology of behavior, in other words, a macro system of behavior which transcends each individual.  

2.5 JEAN PIAGET'S CONTRIBUTION IN COGNITIVE DEVELOPMENT

The leading proponent of cognitive development theory was Jean Piaget (1896-1980). His interest in child psychology was not stimulated simply by desire to suggest the ways in which children at different age levels think about the world around them. In fact he pursued genetic epistemology which according to him was study of mechanisms of the growth of knowledge. To his credit he had over 40 books and hundreds of articles based on a great range of empirical studies. Basic features of Piagetian theory are as follows.

The purpose of all behaviour or all thought, according to Piaget, is to adopt the organism-in this case the human - to the environment in even more satisfactory ways. The techniques of adaptation in Piaget's system are called schemes (schemas or schemata). A scheme, as a technique of adjustment, can be biological or mental or both.

From a Piagetian perspective, development can be seen as a progressive elaboration of schemes or knowledge by means of a pair of complementary processes called assimilation and accommodation. Assimilation occurs when a person encounters a new experience in the environment and interprets this experience as being identical or very similar to a scheme already in his or her repertoire of physical or mental acts. Accommodation applies a general structure to a particular situation which is different at every time. Thus, accommodation always contains an element of novelty. Restrictedly speaking, it leads to the differentiation of a previous structure and, later on, to the emergence of a new structure.

In Piaget's system the process of development of generating a growing complex of schemes is governed by four factors: heredity, physical experience...
with the world of objects, social transmission and equilibrium. Heredity, in Piaget's view furnishes the newborn with the initial equipment the infant needs for coping with the problems met in the world. Heredity also establishes a time schedule for new development potentials to arise at successive stages of the individuals' growing years. A child acts on things and objects. He learns to compare, discriminate, transpose and form concepts. Unlike many theorists, Piaget separated the child's involvement with the environment into two varieties; direct and generally unguided experience and the guided transmission of knowledge known broadly as education or instruction. Piaget contended that the first of these varieties must precede the second. Social transmission is a form of learning encompassing interpersonal relations, verbal instruction and social and cultural experiences. The fourth factor determining development, called equilibrium is a coordinating force, performing the regulation and compensation among the other three factors making entire system of development a coherent whole. This last factor, namely equilibrium, is a gift from Piaget. It is a self-adjustive process which gives meaning to understanding of the world and that too in a dynamic manner.

2.6 STAGES OF DEVELOPMENT

Piaget hypothesized that children's cognitive processes develop in an orderly sequence or series of stages. He believed that the cognitive development of each stage, and of substage within, tend to be universal. One reason for this is that cognitive development largely depends on the maturation of the brain and children's interactions with their environment. Cognitive developments of one stage or substage are made possible by the cognitive achievements of the preceding stage.

In children's cognitive development like motor development and language development, some children may be more advanced than that of other particular ages, but the developmental sequence does not normally vary. Piaget identified four major stages of cognitive development: sensorimotor, pre-operational,
concrete - operational, and formal operational. The four stages in the intellectual functioning of children are as follows :

(a) The Sensorimotor Stage (0-2 years)
(b) The Pre-operational Stage (2-7 years)
(c) The Concrete Operational Stage (7-11 years)
(d) The Formal Operational stage (11-16 years)

The fifth stage is also hypothesized. It relates to individual differences in aptitudes and career commitments.

2.6.1 The Sensorimotor Stage:

The achievements of a normal two-year-old child are as follows:

i. Physical Development: normal
ii. General State: More or less cheerful
iii. Curiosity: Highly curious
iv. Acquisition of Skills: Fast in coping with simple actions of others
v. Physical Stamina. He never gets tired. In fact, he needs a lot of exercise all day long
vi. He has a personality and that too, is in the making. He frowns, resists and cries, if not willing to oblige.

Six substages underlying the sensorimotor stage are given below:

i. Reflective Action (0-1 month)
ii. Primary Circular Reactions or Habitual Actions (1-4 months)
iii. Secondary Circular Reactions or Co-ordination of Actions (4-8 months)
iv. Coordination of Secondary Schemes or Consolidation and Application of Actions (8-12 months)
v. Tertiary Circular Actions or Elucidation and Differentiation of Actions (12-18 months)
vi. Mental Representation of Action (18-24 months)

As the present investigator's study was directly and wholly concerned with the tribal pupils of ages 5+ to 10+ only, she took decision not to discuss all the four stages, in detail. Therefore, the above six substages of "The sensorimotor stage" have not been elaborated.
2.6.2 The Pre-operational Stage:

According to Piaget, the pre-operational stage of cognitive development lasts from about the age of 2 to 6 or 7. Operation means flexible, reversible mental manipulations of objects in which objects can be mentally transformed, then returned to their original states. Pre-operational stage is the second stage in Piaget’s scheme, characterized by inflexible and irreversible mental manipulations of symbols. In order to qualify as operations, actions must be internalizable, reversible and co-ordinated into systems that have laws that apply to the entire system and not just to the single action itself. By internalizable Piaget meant that the actions can be carried out in thought without losing their original character as physical manipulations. By reversible, he meant that they can be readily inverted into their opposite. In this stage, the child is in the stage of preparation for performing true operations.

The pre-operational period has been divided into two levels. The first, from about age 2 to 4, is characterized by both egocentric speech and primary dependence on perception in problem solving. Egocentric speech is not intended as a vehicle of communication with others. The child’s heavy dependence on perception means that in problem solving, he or she draws conclusions from what can be directly seen or heard rather than from what he or she might recall about the permanent characteristics of objects and events.

The level of intuitive thought is reached between ages 5 to 7. It is a transition phase between the child’s depending solely on perception and depending on logical thought in problem solving. While in earlier years children’s thinking suffered from centering; during the intuitive period, they begin to recognize that more than one factor at a time influences an event in a co-ordinate manner.

In pre-operational stage, the child is able to represent the environment in symbolic form and distinguish between himself and objects in the world around him. Both his language and thoughts are characterized by egocentrism. The child is “self-centered” in the literal sense that he is unable to comprehend the view
other people may possess. He acts and speaks on the assumption that what is known to him must be common knowledge to all. This is clearly manifested when a young child attempts to recount an episode which he has experienced.

Spencer 10 remarks, “Pre-operational children also show animism and artificialism in their attributions of causality. In animistic thinking, they attribute life and intentions to inanimate objects, such as the sun and the moon. Artificialism is the belief that environmental features such as rain and thunder have been designed and constructed by people.”

From the Botwin and Murray Study 11 on the first graders for ability to conserve quantities, three conclusions have been drawn.

First, there are different ways of arriving at correct answers to many problems. Second, in many cases experiences and instructions can prompt children to find more advanced solutions to specific problems. But, third, the reasoning processes (that is, the mental operations) of children may be less easy to modify. Advanced ways of thinking about the world may have to unfold largely according to the child’s inner clock.

2.6.3 The Concrete-Operational Stage

According to Piaget the child enters the stage of concrete operations by the age of 6 or 7. This is the third stage in Piaget’s scheme characterized by flexible, reversible operations concerning concrete, specific objects and events. The concrete operational child recognizes that there are certain relationships among numbers - that operations can be carried out according to certain rules. It is this understanding that lends concrete operational thought its flexibility and reversibility.

In this stage, which lasts until about the age of 12, children show the beginnings of the capacity for adult logic. They understand basic rules of logic that Piaget referred to as “groupings.” However, their thought processes, or operations, generally involve tangible objects rather than abstract ideas. This is why it is referred to their thinking as concrete. Some terms need to be understood with the relation to this stage.
Egocentrism: Concrete operational children are less egocentric. Their abilities to take on the roles of others and view the world and themselves, from other peoples’ perspectives are greatly expanded. They recognize that people see things in different ways because of different situations and different sets of values.

Decentration: As compared with preoperational children, who can focus on only one dimension of a problem at a time, concrete operational children can engage in decentration. That is, they can focus simultaneously on multiple dimensions or aspects of a problem. Decentration has implications for conservation, categorical thinking and other intellectual understandings.

Conservation: It is during these years that children’s understanding of conservation matures. The phenomenon of children’s ideas of conservation is one of Piaget’s signal discoveries, and it continues to be the focus of much of the investigation generated from Piaget’s work. The term conservation refers to those aspects or events that remain constant when other changes are produced in objects or situations. When a ball of clay is rolled into a sausage shape, the form has been altered but the substance, weight and mass have been conserved. Distinguishing between what has been changed and what has been conserved during transformations marks a major advance in children’s reasoning skills during this stage.

The concrete operational child is also aware of the principle that objects can have several properties or dimensions. Things that are tall can also be heavy or light. Things that are red can also be bright or dull, or round or square, or thick or thin. Knowledge of this principle allows him to decentre and avoid focusing on only the diameter of the clay pancake. By paying simultaneous attention to both the height and the width of the clay, he recognizes that the loss in height compensates for the gains in width.

Researchers have found that children do not develop conservation in all kinds of tasks simultaneously. For example, conservation of mass usually develops first, followed by conservation of weight and conservation of volume. Piaget
referred to the sequential development of concrete operations as horizontal decalage. As Piaget theorized, the cognitive gains of concrete operational stage are so tied to specific events that achievement in one area does not automatically transfer to achievement in another. Also concrete operational thought requires awareness of the principle of transitivity. Transitivity is the principle that in a property if \( A > B \), and \( B > C \), then \( A > C \).

**Seriation**: Seriation is the placing of objects in a series or order, according to some property or trait. Seriation is made easier when one has knowledge of transitivity. Piaget frequently assessed children’s abilities at seriation by asking them to place sticks in order of size, or to match dolls of different sizes to “walking sticks”. Four-to five-year-old children usually place the sticks in a random sequence, or in small groups, as in small, medium or large. They show similar arrangements with the dolls and walking sticks. Six-to seven-year-old children, who are in transition between the pre-operational and concrete operational stages, may arrive at proper sequences after trial & error. But 7-or 8-year-olds who are capable of concrete operations go about the task systematically, usually without error.

**Classification**: Another example of an operation is class inclusion, or the organizing of objects into categories. One classification operation is the grouping of three red roses and four yellow roses to make up seven roses. One can then include these seven roses in the same class with four daisies to make up 11 flowers. One can go on to include the 11 flowers with three trees to make up 14 plants. Roses, flowers, and plants are just examples of the types of classes that we can form when we travel up the hierarchy of living things

Classes are determined by the characteristics shared by their members. Only closed geometric figures with four sides equal in length fit into the class of squares. But both circles and squares fit into the class of geometric figures. Yellow and red roses both fit into the class of roses, because they have in common the characteristics that make up roses. However, red roses do not fit
Concrete operational children can focus on two dimensions (classes and subclasses) at the same time. Therefore, they are more likely to answer the question about the roses and the flowers correctly. But their thought remains concrete in that they will give correct answer, if they are asked about roses and flowers, but not if one attempts to phrase the question in terms of abstract symbols, such as A, B₁, and B₂.

By the end of the concrete-operations period, children markedly increase their abilities to account for the cause of physical events so that they are now ready not to solve only problems that involve objects, but also ones concerning hypotheses and propositions about relationships.

2.6.4 The Formal-operational Stage

The stage of formal operations is the final one in Piaget’s scheme. It is the stage of cognitive maturity. This stage begins at about the puberty - the age of 11 or 12. However, not all children enter this stage at the time of puberty and some people never reach it. Major tasks of the stage of formal operations involve classification, logical thought, and the ability to hypothesize. Central features are the ability to think about ideas as well as objects and to group and classify ideas - symbols, statements, entire theories. "The flexibility and reversibility of operations, when applied to statements and theories allow adolescents to follow arguments from premises to conclusion and back again." Because of several other considerations the adolescent possesses a greater capacity to manipulate and appreciate the entire environment. He can systematically solve problems, use symbols and have deductive reasoning.

At about the end of this period, maturity of thought is manifested as seen through the use of symbols in the operational thinking. The adolescent develops concept of concepts, a sort of second and third order reflection. It is at this
stage that the two components of reversibility, namely, negation and reciprocity get interrelated and unified firmly

2.6.5 Limitations of Piaget’s Theory:

"It is probably fair to say that Piaget views himself as a biologically oriented genetic epistemologist first, a psychologist second, and an educator not at all. The ontogenic origins of number, time, space, and causality and other concepts have been his major concerns, not the most effective ways such concepts could or should be taught in the schools." 13

"Piaget has always addressed the issues in most general terms without ever being specific as to what teachers and children should be doing in any concrete case. Piaget occasionally argues that our knowledge of mental development is still not sufficiently thorough to serve as a basis for a scientific pedagogy, and he may be right."14

"Piaget’s theoretical constructs leave considerable to be wished for. This holds true for his concepts of accommodation and assimilation, his concept of the role of lack of equilibrium in development, and his concept of stages in the epigenesis of intellectual development."15

2.7 EXPLANATION OF SOME CONCEPTS

Piaget used concepts such as schemes, assimilation, accommodation and equilibration, and he tied them together to describe and explain cognitive development.

Schemes: Piaget defines the scheme as a pattern of action or a mental structure that is involved in acquiring or organizing knowledge. According to Piaget, acting on the environment and acquiring knowledge occur simultaneously or are equivalent forms of behaviour. As action patterns, schemes tend to be repeated and to occur in certain types of situations. A scheme is a pattern of activity which is co-ordinated and acts as an integrated whole, e.g. the individual responses made by the beginner learning tennis become integrated into one smoothly flowing
action, or scheme. Piaget also suggests that through varied experiences schemata are built up and can be used in a variety of situations. We don’t use identical responses in every given situation. The scheme has a common core into which many similar behaviours are integrated. This common core can be used in a variety of situations.

Assimilation: The concept of assimilation reflects Piaget’s early interest in biology. In biology, assimilation is the process by which food is digested and converted into the tissues that compose an animal. The cognitive process of assimilation is akin to both biological and cultural assimilation. Cognitive assimilation is the process by which new events are responded to according to existing schemes or ways of organizing knowledge. Novel objects or events are never taken quite as they are. Instead, they are chocked for fit against the child’s mental structures or cognitive organizations. These organisations transform them into meaningful events. New events mean something, because they can (or can not) be assimilated by existing schemes, children’s cognitive organizations change dramatically as they mature and gain experience. Thus assimilation takes dramatically different forms at different ages. Assimilation occurs throughout life.

Accommodation: It is also a biological term which means a change in structure that permits an organism to adjust or adapt to a novel object or event, to a new source of stimulation. When it applies to cognitive development, accommodation is the transformation of existing ways of organizing knowledge, or schemes, so that new information can be incorporated. At first infants may be able to engage in reflexive rooting and sucking only when held in certain positions. But even within a few days, they accommodate to the demands imposed by new positions by twisting and turning their bodies to reach the nipple and other objects. They gain knowledge that certain things are not to be sucked and may experiment with new ways to relate to them.
In every infraction schemes are not applied without recognition of the varying properties of objects and a subsequent adaptation. A scheme modifies itself according to the particular characteristics of the object. A scheme of reaching for and grasping something must accommodate to the distance of the object, e.g., a scheme of reaching for and grasping something must accommodate to the distance of the object and to its size and weight. So no two applications of a scheme are exactly alike. Scheme becomes more differentiated and able to respond differently to the various objects it assimilates. Assimilation means that the organism had adapted and can handle the situation presented to it; accommodation means that it must change in order to adapt.

**Equilibration**: When children can assimilate new events to existing schemes, they are in a state of cognitive harmony, or equilibrium. When something that does not fit happens along, their state of equilibrium is disturbed; they experience cognitive disharmony and attempt to restore harmony. The restoration of harmony may demand both assimilation and accommodation - a back and forth process that is termed equilibration. So the process of reverting equilibrium is termed equilibration. Piaget believed that the attempt to restore equilibrium is the source of intellectual motivation and lies at the heart of the natural curiosity of the child. About the second birthday, the process of assimilation and accommodation tend to come into balance. So the capacity for equilibration increases dramatically. Children become more efficient problem solvers and their intellectual functioning blossoms.

### 2.8 EVALUATION OF PIAGET'S THEORY

1. Was Piaget's timing accurate?

Some researchers have shown that Piaget underestimated the abilities of preschoolers. They have shown that children are capable of conservation and other concrete operational tasks earlier than Piaget believed.
2. Was Piaget’s use of concepts too global?

A number of investigators have found that Piaget’s use of terms such as egocentrism, centration, and conservation may have been too global.

3. Is cognitive development really discontinuous?

Many argue that cognitive skills such as egocentrism and conservation appear to develop more independently and continuously than Piaget thought. Some researchers argue that cognitive development is not stagelike at all. The acquisition process may be gradual, not discontinuous. Children’s cognitive skills at a given age show horizontal inconsistencies. In horizontal decalage, conservation does not arrive all at once. Instead, children develop conservation for mass, weight, and volume at different ages. The onset of conservation may be more continuous than cognitive-developmental theory suggests. If this is so, the onset of conservation could be viewed in terms of the gradual accumulation of problem-solving abilities, instead of changing cognitive structures.

4. Are the sequences of development invariant?

Here the probable answer is yes. The sequences of cognitive change—even within horizontal decalage—appear to remain invariant. It appears that sequences of development are more essential to Piaget’s theory than their timing.

In sum, the great majority of developmentalists regard Piaget as a towering figure in the study of cognitive development, but it is erroneous to view his approach as the only one. There are many others, including information-processing approaches. These approaches focus on children’s memories and problem-solving abilities. However, whereas Piaget used the biological models of assimilation and accommodation as his model for cognition, information-processing theorists have turned to the computer and artificial intelligence.
Features like hypothetical thinking, systematic problem solving, the ability to use symbols and deductive reasoning give a greater capacity to manipulate and appreciate the outer environment and the world of the imagination. By the end of this final stage of cognitive development the youth is capable of logic that the adult commands. Then further experiences over the years of youth and adulthood fill in the outline with additional, more complex schemes so that the adult's thought is more mature and free of lingering vestiges of egocentrism than is the adolescent's.
REFERENCES


8. Ibid., : p. 788.


10. Ibid., : p. 317.

11. Ibid., : p 322

12. Ibid., : p. 325.

