**Cognitive Development**

This is also referred to as intellectual or mental development and it relates to the child’s ability to think or reason and understand as the child advances in age.

**Stages of Cognitive Development by Piaget**

Piaget assumed that all children, regardless of culture, go through four (4) stages of cognitive or intellectual development namely sensory-motor, pre-operational, concrete operational and formal operational.

**Sensory-motor stage. (0-2 years)**

As the name implies, the infant uses senses and motor abilities to understand the world, beginning with reflexes and ending with complex combinations of sensory motor skills (Boeree, 2003). The child’s thinking is limited to the here and there; the primary mode of perceiving and understanding his environment is by action rather than by symbolic representation. During this period the child gradually develops an objects concept and the knowledge that objects exist independently of the child’s experiences. Also during this time the child begins to develop understanding of space, time and cause effect relationship. This stage their senses and motor because during it babes and young children explore their world by using their senses and-motor abilities, i.e. what they can see touch or hear. According to Piaget, the child in the *sensory motor stage* primarily explores the world with senses rather than through mental operations. At this initial stage of development, these actions are reflexive in nature. That is they are done involuntarily and they lack co-ordination. Soon these movements become more purposeful, as infant explores the environment and learns that specific movement will produce the specified results. For example, the infant may learn that crying brings the mother or banging the table with a spoon will produce dinner.

The child at about 18 months begins to develop a sense of self and symbolic thought. One important from of symbolic thought is the use of language.

A major accomplishment at this stage according to Piaget, is object permanence-the understanding that something continues to exist even if you cannot see or touch it.

**Pre-operational stage (2-7 Years).** The child is able to present symbolically things and events that are not present. However, thinking during this period is still largely non-logical. The child is perceptually bound; he takes all of his perceptions literally. The child is centered, he is not aware of the viewpoints of others. The child cannot understand the ideas of classes or sets, and he gives immature answers in various conservation problems; he believes that the amount of liquid changes when it is poured from one container to another, that the number of objects can change when their configuration changes and so on (Hutchinson, 2003). The hallmark of the preoperational stage is sparse and logically inadequate mental operations. Children at this stage begin to do some thinking but the thinking is faulty. There is the absence of adult-like logic in the thinking of the pre-operational child. The thinking is full of contradictions.

According to Piaget, at the pre-operational stage children cannot grasp that concept of conservation-the understanding that physical do not change when their form or appearance changes. They are unable to understand that an amount of water or liquid is the same even if the liquid is poured from one glass to another.

The Preoperational Stage can be further broken down into Preconception Stage and the Intuitive Stage.

***The Pre-conceptual*** *stage* (2-4 years) is marked by egocentric thinking and animistic thought. A child who displays animistic thought tends to assign living attributes to objects, for example that a glass would feel pain if it were broken.

***The Intuitive*** (2-4 years) stage is when children start employing mental activities to solve problems and obtain goals but they are unaware of how they came to their conclusions. For example a child is shown 7 dogs and 3 cats and asked if there are more dogs than cats. The child would once again respond positively. However when asked if there are more dogs than animals the child would once again respond. Such fundamental errors in logic show the transition between intuitiveness in solving problems and true logical reasoning acquired in later years when the child grows up.

**Concrete operational stage (7-11 years)**. The child’s thinking begins to manifest logical properties. He understands most kinds of conservation and uses classes in his thinking. Their major limitation is that the child’s thinking is limited to concrete rather than abstract objects and ideas, and thus it is impossible for him to outline a series of possibilities in his mind and test them systematically (Hutchinson, 2003). At this stage, the nature and quality of children’s thought changes significantly. Children’s thinking is called concrete because it is still grounded in concrete experiences and concepts. Children do not have much ability to understand most abstract objects.

***Important processes during this stage are:***

Conservation – understanding that quantity, length or number of items is unrelated (remain the same) to the arrangement or appearance of the object or items.

The following are activities, which KG and primary school teachers can use to check children’s ability to conserve

Activity 1. Conservation of volume. The child is presented with two identical containers containing equal amount of water. In the full view of the child the teacher pours the water from one of the container into a third container which is thinner and taller than the two identical containers. The teacher than ask whether the two container that now contain water hold equal amounts, or whether one container has more than the other. A child, who has not mastered the concept of conservation, believes that the thinners and taller container contains water. This child is influenced by what he/ she sees.

Activity 2. Conservation of length. Two sticks are aligned in front of the child, who acknowledges that they are of equal length. One of the sticks is moved to the right. The child is asked whether they are still the same in length. A non-conserving child would say they are not the same.

Activity 3. Conservation of number. Two rows of bottle tops are lined up next to each other. The child acknowledges that the two rows have equal number of bottle tops. One of the rows is made to become longer (i.e. elongated). The child is asked if there are still the same numbers in each group. Any child who says there is a difference is yet not conserving numbers.

Seriation – the ability to sort objects in an order according to size, shape, or any other characteristic. For example, if given different-shaded objects they may make a color gradient.

Activity. Present sticks of varying length to the child. Ask the child to line them up. The child at the concrete operational stage can arrange from shortest to longest or vice versa, even without instruction.

Classification –their ability to name and identify sets of objects according to appearance, size or other characteristic, including the idea that one set of objects can include another. A child is no longer subject to the illogical limitations of animism) the belief that all objects are alive and therefore have feelings)

Activity. Present different collections of cards of different shapes and colours. Let children first group the cards according to colure and later according to shape. Children who succeed in this task are said to achieve classification.

Disinterring –where the child takes into account multiple aspects of a problem to solve. For example, the child will no longer perceive an exceptionally wide but short cup to contain less than a normally-wise, taller cup.

Reversibility-where the child understands that number or objects can be changed, then textured to their original state. For this reason, a child will be able to rapidly determine that if 4+4 equals 8, 8-4 will equal(s) 4, the original quantity.

Elimination of Egocentrism – the ability to view things from another’s perspective (even if they think incorrectly). For instance, show a child a comic in which Jane puts a doll under a box leaves the room, and then Melissa moves the doll to a drawer, and Jane comes back. A child in the concrete operations stage will say that Jane will still think it’s under the box even though the child knows it in the drawer.

Formal operation stage (11+). The child begins to see reality as a subset of the possible. He can test hypotheses systematically, he can understand second order conservation such as conservation of volume, and the can perform operations on abstract ideas (Hutchinson, 2003). The formal operational period is the fourth and final of the stage of cognitive development in Piaget’s theory. This stage, which follows the Concrete Operational stage, commences at around 11 years of age (puberty) and continues into adulthood. It is characterized by acquisition of the ability to think abstractly, reason logically and draw conclusion from the information available. During this sage the young adult is able to understand such things as love logical proofs, and values.

**Educational Implications of Piaget’s Theory.**

A child’s level of development should be taken into consideration when deciding on teaching methods to use and information to impart in the class.

There is the need to employ questions and testing in the teaching and learning process to ascertain whether a child has acquired certain abilities or concepts.

Teaching and learning materials should be used to facilitate learning. Creating a rich environment is therefore essential.

Children should be made to take active part in lessons. This is because children are inherently active and this should be explored.

Level of cognitive development implies the existence of individual. Even age and time of onset or termination of a period or stage of cognitive varies from one person to another. This means in teaching, the teachers should make room for individual differences.

There is the need to provide for social interaction in the classroom. Thought social interaction, the child is made aware of, and appreciates the ideas and opinions of his/her peers and adults. That is instructional method should provide for interaction.

**Bruner - Learning Theory in Education**

Bruner (1966) was concerned with how knowledge is represented and organized through different modes of thinking (or representation).

In his research on the cognitive development of children, Jerome Bruner proposed three modes of representation:

Enactive representation (action-based)

Iconic representation (image-based)

Symbolic representation (language-based)

Bruner's [constructivist theory](https://www.simplypsychology.org/constructivism.html) suggests it is effective when faced with new material to follow a progression from enactive to iconic to symbolic representation; this holds true even for adult learners.

Bruner's work also suggests that a learner even of a very young age is capable of learning any material so long as the instruction is organized appropriately, in sharp contrast to the beliefs of Piaget and other stage theorists.

**Bruner's Three Modes of Representation**

Modes of representation are the way in which information or knowledge are stored and encoded in memory.

Rather than neat age-related stages (like [Piaget](https://www.simplypsychology.org/piaget.html)), the modes of representation are integrated and only loosely sequential as they "translate" into each other.

**Enactive (0 - 1 year)**

The first kind of memory. This mode is used within the first year of life (corresponding with [Piaget’s sensorimotor stage](https://www.simplypsychology.org/sensorimotor.html)). Thinking is based entirely on **physical actions**, and infants learn by doing, rather than by internal representation (or thinking).

It involves encoding physical action based information and storing it in our memory. For example, in the form of movement as a muscle memory, a baby might remember the action of shaking a rattle.

This mode continues later in many physical activities, such as learning to ride a bike.

Many adults can perform a variety of motor tasks (typing, sewing a shirt, operating a lawn mower) that they would find difficult to describe in iconic (picture) or symbolic (word) form.

**Iconic (1 - 6 years)**

Information is stored as **sensory images** (icons), usually visual ones, like pictures in the mind. For some, this is conscious; others say they don’t experience it.

This may explain why, when we are learning a new subject, it is often helpful to have diagrams or illustrations to accompany the verbal information.

Thinking is also based on the use of other mental images (icons), such as hearing, smell or touch.

**Symbolic (7 years onwards)**

This develops last. This is where information is stored in the form of a code or symbol, such as **language**. This mode is acquired around six to seven years-old (corresponding to [Piaget’s concrete operational stage](https://www.simplypsychology.org/concrete-operational.html)).

In the symbolic stage, knowledge is stored primarily as words, mathematical symbols, or in other symbol systems, such as music.

Symbols are flexible in that they can be manipulated, ordered, classified, etc. so the user isn’t constrained by actions or images (which have a fixed relation to that which they represent).