

CONSTRUCTIVISM & STUDENT CENTERED LEARNING

3. JEAN PIAGET'S THEORY OF COGNITIVE DEVELOPMENT

3.1. Introduction

Jean Piaget was employed at the Binet Institute in the 1920s, where his job was to develop French versions of questions on English intelligence tests. He became intrigued with the reasons children gave for their wrong answers on the questions that required logical thinking. He believed that these incorrect answers revealed important differences between the thinking of adults and children. So, in 1936 Piaget was the first psychologist to make a systematic study of cognitive development. His contributions include a theory of cognitive child development, detailed observational studies of cognition in children, and a series of simple but ingenious tests to reveal different cognitive abilities. Before Piaget's work, the common assumption in psychology was that children were merely less competent thinkers than adults. Piaget showed that young children think in strikingly different ways as compared to adults. According to Piaget, children are born with a very basic mental structure, genetically inherited and evolved, on which all subsequent learning and knowledge is based.

3.2. Piaget's Theory of Cognitive Development

The theory of cognitive development is a comprehensive theory about the nature and development of human intelligence, first developed by Piaget. It is primarily known as a developmental stage theory but, in fact, it deals with the nature of knowledge itself and how humans gradually acquire, construct, and use it. Moreover, Piaget developed the idea that cognitive development is at the center of human organism, and language is contingent on cognitive development. Piaget's theory differs from others in several ways:

- It is concerned with children, rather than all learners.
- It focuses on development, rather than learning, so it does not address learning of information or specific behaviors.

- It proposes discrete stages of development, marked by qualitative differences, rather than a gradual increase in number and complexity of behaviors, concepts, ideas, etc.

The goal of the theory is to explain the mechanisms and processes by which the infant, and then the child, develops into an individual who can reason and think using hypotheses. To Piaget, cognitive development was a progressive reorganization of mental processes as a result of biological maturation and environmental experience. He felt that children construct an understanding of the world around them, then experience discrepancies between what they already know and what they discover in their environment. There are three basic components to Piaget's cognitive theory:

1. **Schemas:** Building blocks of knowledge
2. **Equilibrium, Assimilation and Accommodation:** Adaptation processes that enable the transition from one stage to another
3. **Stages of Development:** Sensorimotor, preoperational, concrete operational, formal operational

Schemas

Piaget defined a schema as a cohesive, repeatable action sequence possessing component actions that are tightly interconnected and governed by a core meaning. In more simple terms, Piaget called the schema a basic building block of intelligent behavior or a way of organizing knowledge. Indeed, it is useful to think of schemas as "units" of knowledge, each relating to one aspect of the world, including objects, actions and abstract (i.e. theoretical) concepts. When Piaget talked about the development of a person's mental processes, he was referring to increases in the number and complexity of the schemata that a person had learned. When a child's existing schemas are capable of explaining what it can perceive around it, it is said to be in a state of equilibrium, i.e. a state of cognitive or mental balance. Piaget emphasized the importance of schemas in cognitive development, and described how they were developed or acquired. A schema can be defined as a set of linked mental representations of the world, which we use both to understand and to respond to situations. The assumption is that we store these mental representations and apply them when needed. For example, a person might have a schema about buying a meal in a restaurant. The schema is a stored form of the pattern of behavior which includes looking at a menu, ordering food, eating it and paying the bill. This is an example of a type of schema called a script. Whenever they are in a

restaurant, they retrieve this schema from memory and apply it to the situation. The schemas Piaget described tend to be simpler than this, particularly those used by infants. He described how, as a child gets older, his or her schemas become more numerous and elaborate.

Piaget believed that newborn babies have a small number of innate schemas, even before they have had much opportunity to experience the world. These neonatal schemas are the cognitive structures underlying innate reflexes. These reflexes are genetically programmed into us. For example babies have a sucking reflex, which is triggered by something touching the baby's lips. A baby will suck a nipple, a comforter, or a person's finger. Piaget therefore assumed that the baby has a 'sucking schema'. Similarly the grasping reflex which is elicited when something touches the palm of a baby's hand, or the rooting reflex, in which a baby will turn its head towards something which touches its cheek, were assumed to result from multiple operations: for example shaking a rattle would be the combination of two schemas, grasping and shaking.

Assimilation, Accommodation, and Equilibrium

Through his study of the field of education, Piaget focused on two processes, which he named assimilation and accommodation. Assimilation describes how humans perceive and adapt to new information. It is the process of fitting new information into pre-existing cognitive schemas. Assimilation occurs when humans are faced with new or unfamiliar information and refer to previously learned information in order to make sense of it. Unlike it, accommodation is the process of taking new information into one's environment and altering pre-existing schemas in order to fit in the new information. Piaget viewed intellectual growth as a process of adaptation (adjustment) to the world. This happens through:

- **Assimilation** - Which is using an existing schema to deal with a new object or situation.
- **Accommodation** - This happens when the existing schema (knowledge) does not work, and needs to be changed to deal with a new object or situation.
- **Equilibration** –This is the force, which moves development along. Piaget believed that cognitive development did not progress at a steady rate, but rather in leaps and bounds.

To Piaget, assimilation is integrating external elements into structures of lives or environments, or those we could have through experience. It is through assimilation that accommodation is derived. Accommodation is imperative because it is how people will continue to interpret new concepts, schemas, frameworks, and more. Assimilation is different from accommodation by how it relates to the inner organism due to the environment. Piaget believes that the human brain has been programmed through evolution to bring equilibrium, which is what Piaget believes ultimately influences structures by the internal and external processes through assimilation and accommodation. Piaget's understanding is that these two functions cannot exist without the other. To assimilate an object into an existing mental schema, one first needs to take into account or accommodate to the particularities of this object to a certain extent. For instance, to recognize (assimilate) an apple as an apple, one must first focus (accommodate) on the contour of this object. To do this, one needs to roughly recognize the size of the object. Development increases the balance, or equilibration, between these two functions. When in balance with each other, assimilation and accommodation generate mental schemas of the operative intelligence. When one function dominates over the other, they generate representations which belong to figurative intelligence.

Equilibrium occurs when a child's schemas can deal with most new information through assimilation. However, an unpleasant state of disequilibrium occurs when new information cannot be fitted into existing schemas (assimilation). Equilibration is the force which drives the learning process as we do not like to be frustrated and will seek to restore balance by mastering the new challenge (accommodation). Once the new information is acquired the process of assimilation with the new schema will continue until the next time we need to make an adjustment to it.

Stages of Development

A child's cognitive development is about a child developing or constructing a mental model of the world. Imagine what it would be like if you did not have a mental model of your world. It would mean that you would not be able to make so much use of information from your past experience, or to plan future actions. Jean Piaget was interested both in how children learned and in how they thought. Piaget studied children from infancy to adolescence, and carried out many of his own investigations using his three children. He used the following research methods:

- **Naturalistic observation:** Piaget made careful, detailed observations of children. These were mainly his own children and the children of friends. From these, he wrote diary descriptions charting their development.
- **Clinical interviews and observations:** These were used with older children who were able to understand questions and hold conversations.

Piaget believed that children think differently than adults and stated they go through 4 universal stages of cognitive development. Development is therefore biologically based and changes as the child matures. Cognition therefore develops in all children in the same sequence of stages. Each child goes through the stages in the same order, and no stage can be missed out, although some individuals may never attain the later stages. There are individual differences in the rate at which children progress through stages. Piaget did not claim that a particular stage was reached at a certain age. However descriptions of the stages often include an indication of the age at which the average child would reach each stage. Piaget believed that these stages are universal or that the same sequence of development occurs in children all over the world, whatever their culture.

Stage of Development	Key Feature	Research Study
Sensorimotor 0 - 2 yrs.	Object Permanence	Blanket & Ball Study
Preoperational 2 - 7 yrs.	Egocentrism	Three Mountains
Concrete Operational 7 – 11 yrs.	Conservation	Conservation of Number
Formal Operational 11yrs +	Manipulate ideas in head, e.g. Abstract Reasoning	Pendulum Task

3.3. Educational Implications

Piaget did not explicitly relate his theory to education, although later researchers have explained how features of Piaget's theory can be applied to teaching and learning. As a result, Piaget has been extremely influential in developing

educational policy and teaching. For example, a review of primary education by the British government, in 1966, was based strongly on Piaget's theory. Discovery learning, the idea that children learn best through doing and actively exploring was seen as central to the transformation of primary school curriculum. The report's recurring themes are individual learning, flexibility in the curriculum, the centrality of play in children's learning, the use of the environment, learning by discovery and the importance of the evaluation of children's progress. As such, teachers should not assume that only what is measurable is valuable. Because Piaget's theory is based upon biological maturation and stages, the notion of readiness is important. Readiness concerns when certain information or concepts should be taught. According to Piaget's theory, children should not be taught certain concepts until they have reached the appropriate stage cognitive development.

According to Piaget, assimilation and accommodation require an active learner, not a passive one, because problem-solving skills cannot be taught, they must be discovered. Within the classroom learning should be student-centered and accomplished through active discovery learning. The role of the teacher is to facilitate learning, rather than direct instruction. Therefore teachers should encourage the following within the classroom:

- Focus on the process of learning, rather than the end product of it.
- Using active methods that require rediscovering or reconstructing "truths".
- Using collaborative, as well as individual activities (so children can learn from each other).
- Devising situations that present useful problems, and create disequilibrium in the child.
- Evaluate the level of the child's development, so suitable tasks can be set.

The influence of Piaget's ideas in developmental psychology has been enormous. He changed how people viewed the child's world and their methods of studying children. He was an inspiration to many who came after and took up his ideas. Piaget's ideas have generated a huge amount of research which has increased our understanding of cognitive development. His ideas have been of practical use in understanding and communicating with children, particularly in the field of education.