Contributions of jean piagets cognitive developmental theory

Jean Piaget was born in the capital of the Swiss canton of Neuchâtel on Lake Neuchâtel on August 9, 1896. From age 10 he wrote a notice about albino sparrow, the pure white birds, which is lack the common sparrow's usual brown, grey and black pigmentation. That event helped J. Piaget to prove himself to the librarian who was behaving him like only child without respect of researcher. He was a determined person and from that moment he was able to find the answers of his questions by reaching university library conveniently. Like one of his quotes, " Scientific knowledge is in perpetual evolution; it finds itself changed from one day to the next" (www. piaget. org). He was initially interested in Mollusks which is comprised of all the shelled living organisms of the sea coast excluding barnacles and he published related papers before his graduation from Neuchâtel Latin high school. Then he applied at the University of Neuchâtel in the same city and this time his major was natural sciences instead of zoology. During his graduate education he went to Zurich for one semester at the University of Zürich where he undertook lectures of Carl Jung and his interest shifted to the field of psychoanalysis area. As well known fact he spent one work year in Solborne, Paris where he met Theodore Simon in Alfred Binet's laboratory. He worked on intelligence test and standardized it. He didn't focus on right or wrong answers but he considered the way of children's reasoning. He recognized that some groups of children who are from same ethnic origin were doing same mistakes on the intelligent test so he deduced the difference between the way of perception adult and children (Papert, 2008).

After he arrived to his home country, Switzerland, he started to observe the act of children to figure out how they perceive or misperceive the real world

distinctively. In Genova he was the director at the J.-J. Rousseau Institute. Difference on cognitive tasks in children is derived him to discover the theory of developmental stages from birth in childhood period. He stated that even if a guider explains one situation to children briefly, they tend to invent that situation by themselves. These four stages of childhood development are comprised of sensori-motor, preoperational, concrete operational, and formal operational stages (Pass, 2004; Dewey, 2007).

The way of acquiring knowledge of children stayed in Piaget's interest area when he was bringing up his children with his wife, as well. His wife name is Valentine Châtenay who was working together with him in his post graduation as student, and they married in 1923. His wife always supported Piaget in his life. They had three children. That means she gave him an opportunity to shift his focus from child psychology to pedagogy because of concerning their children developmental stages related to his research. He examined their development step by step. Chronologically their first daughter whose name is Jacqueline was born in 1925, then two years later the second one, Lucienne, was born and lastly their son was born in 1931. His name is Laurent. Piaget observed them to get some ideas about what is going on in a child's mind. Actually Piaget did not used statistical search about their studies, he preferred clinical methods as he called. In other words he used technique of dialogues and little conversations among children to understand their cognition ability. Some cases he asked children to do specific tasks to see how they think and take action (Pass, 2004; Dewey, 2007).

Fundamentally thinking that running faster could spends more time by seven years old children took attention of Albert Einstein. This finding of Piaget probably leaded Einstein about his relativity theory. Piaget worked as the director of International Bureau of Education from 1929 to 1967. In most prestigious universities of United States of America such as University of California, Berkeley, and Cornell University he asked to be chief consultant at two conferences. In these conferences he mentioned the connection between cognitive science and curriculum development. He also chaired as the director of experimental psychology in psychology laboratory and the president of the Swiss Society of Psychology in 1940. Two years later he started to his lectures related to the psychology of intelligence at the Collège de France when German forces occupied the France. After Second World War, he was able to announce and spread his research around the world countries in safe circumstances. And he became chair of Swiss Commission of UNESCO as the president. The following years he took honorary degrees from University of Brussels and the University of Brazil (Boeree, 2008; Papert, 2008).

Another immense contribution of research came from his real interest. He was always interested in theory of knowledge during his life. It is called epistemology which was thinking a branch of philosophy like the same make mistake in physics. Piaget changed this misunderstood. He published his work on it with the title of " Introduction to Genetic Epistemology" in 1950. Finally he called himself as an epistemologist after working many field of area influenced by himself. He focused the answer of the question that how the transition is made from a lower level of knowledge to a level that is

judged to be higher. From this point of view, he served as professor in 1952 at the Sorbonne which refers to the historic University of Paris in Paris, France. Three years later he founded and directed International Center for Genetic Epistemology. In the rest of his life he continued working in this center related to general theory of structures. He eagerly published many books and papers during his life. He was pioneer in the field of studies he touched and his affects on the child development is still durable. He passed away in Geneva, September 16, 1980 with bequeathing his researches for us to develop and take it a step further. (Boeree, 2008 ; Papert , 2008).

Brief information about the life of Piaget was taken from www. piaget. org

CHAPTER 2

COGNITIVE DEVELOPMENT

Intellectual organization and adaptation

Piaget believes that acts of adaptation to the physical environment and help organize the environment. He indicated that the mind and body are dependent with each other. So generally mental activity is similar to biological activity. He defined the intellectual development same way to biological development. Their process is adaptation of organism to the environment and organization of experiences. (Wadsworth, 1996). Human behaviors are not decided by fixed urges and instincts; however, developed schemas and structure take role actively (Kohler, 2008).

Piaget's key concepts of the cognitive theory;

SCHEMA; Piaget defined schema as the cognitive or mental structures. Individuals use these structures for adapting to and organizing environment intellectually (Wadsworth, 1996). Concept of schema is placed center importance of Piaget's theory because it is precursors of sensory motor to cognitive structures. Cognitive structures are characterized later stages of intellectual development. Piaget explained something else that is behaving in ways which can be described thanks to schemas. The schemas can be general or complex. For instance the simple sucking sequence of the new-born child and the complex schemata consist of football game. In order to become a schema, there should be a repeated behavior sequence. Another important characteristic of schema is identifying a class of action sequences which can be different from each other on the other hand they have same meaning for the subject. If we give an example, it can be grasping schema, it manipulated depend on shape of object or physiological condition of infant. (Atkinson, 2006).

A schema can be described as a way of seeing the world, a certain aspect on the world. " The schema is a plastic way of organizing experience; it is not a rigid mould in to which experience is poured." (Atkinson, 2006, p. 69).

Although newborns have limited schemas, like sucking. They are fundemental for later sensori motor actions. Therefore gaining quantities of schemas are linked to ever more complex patterns. For comprehending process of evolving schemas, accommodation and assimilation help explain (Thomas, 2005).

ASSIMILATION; Assimilation is “ the basic fact of psychological life” (Piaget 1936, p. 53 as cited in Kohler, 2008). Outer world can be adapt by oneself as his/her own extension with necessary alteration. (Kohler, 2008). The means of assimilation is that individuals assimilate new perceptual, motor, or abstract matter into existing schemata or patterns of behavior. “ Managing and embracing of the surroundings where we live in is mentally a task of assimilation (Wadsworth, 1996, p. 17).

Function of assimilation is helping children to use of schemas in order to adapt to the environment with the purpose of satisfying their needs. While satisfying needs, children look over the environment to perceive how its apparent structure emerges from schemas which come from their current repertoire. If they apply this matching, they accomplish adaptation. (Thomas, 2005). Assimilation is not over so human beings continue this process by means of raising number of schemas. On the other hand; schema doens’t alter by assimilation, because assimilation serves to grow the schemas. According to Wadsworth (1996) when given an imitation, schema looks like a balloon, assimilation is air. While putting air into balloon, it leads to getting larger balloon; however it doesn’t modify balloon shapes.

At the beginning of the development, children play with toys to understand and perceive how toys fit in their initial cognitive platform. If any material is shaped to one object such as a toy of car, then children internalize this material and match it with schema of a car. If this internalization does not work, another shape of object should be tried (Kohler 2008).

ACCOMMODATION; According to Piaget it occurs when ‘ the environment acts on the organism’ so the organism has to re- adjust and re-organize itself (Cohen, 1983). According to Piaget (1937); accommodation is adaptation of the organism to the environment. When children repertoire of schemas doesn’t match with perceived structures of events, there is several ways can be seen. Firstly assimilations aren’t occured succesfully. This can be happaned owing to meaningless or ignored structures. Secondly; the quality of schemas doesn’t fit with the perceived environment, but; this is not fulfillment also go on effecting to assimilation. Therefore; human beings encounter an obligation that schemas are converted into perceived realities of the environment in order to fix incomplete matching (Kohler, 2008). The accommodation requires two ways if the own schemata can’t be approximate for the characteristics of stimulus, create new schema for placing or change an existing schema. This leads to build one or more schemata. But the end of the action is assimilation because new schemata can be used for others structures (Wadsworth, 1996). Piaget inserted accommodation into the terminology to describe why case of assimilation naturally occurs in experiments of human being when there is a change on repertoire of schema. (Kohler, 2008).

Children form the shemata and then it affects the way of their view of the world. Owing to constructions, schemata are not completely same with reality. This process proceed to be similar apparance to the reality over the time. There is different between child especially infant and adults. Bacause; infants schemas are more unique and universal. Their schemas are often not similar with real and vague. Use of assimilation and accommodation develop

these primitive schemas for being more sophisticated eventually (Wadsworth, 1996).

According to Kohler (2008) new events can’t fit with past events in the formation of schemas. It causes the degree of mismatch schemes with new events. But by the balancing combining form between assimilation and accommodation improved this mismatch. Assimilation and accommodation is called as “ functional invariants” by Piaget which is two of the basic instinctive process. In the adaptation process assimilation and accommodation is used for ensuring all of the schemas are interconnected and accustomed to each other to shape “ an integrated person”. According to Piaget (1963); there is relation with each of intellectual operation and all the others. So the same law is in charge of every structure. Consequently; every schema is take role in all the others schema. All of them compose totality with diverse parts (Kohler, 2008).

Term of accommodation explains categorical contrast on development and assimilation explains numerical contrast on growth. Both of them are necessary for description of adjustment and improvement on mentality. (Wadsworth, 1996).

Mentally growth and development can be possible during experiences of assimilation and accommodation with balanced consideration (Wadsworth, 1996).

EQUILIBRATION;

There is essential that balance between assimilation and accommodation. The balance between assimilation and accommodation is called equilibrium by Piaget. It is the self- regulatory which makes certain grows child’s efficient interaction with the environment. Equilibrium is highly important because sometimes person use assimilation but not use accommodation, inability find differences owing to too much schemata or construct not enough schemata person can’t find similarities. They can cause problem which is abnormal intellectual growth.

Equilibration; disequilibrium is defined as an imbalance between assimilation and accommodation. Indeed; process of changing disequilibrium into equilibrium is equilibration. Equilibration allows external experience to be incorporated into internal structures (schemata). When disequilibrium occurs, it activates behavior for searching more assimilation or accommodation (Kohler, 2008).

if we define equilibrium in a very simple way as a principle that affirms a relation between a system (or an organism) and its environment, so that any change in the environment produces an adjustment of the system in the sense that it tends to keep constant a certain number of conditions of existence of the system which are considered desirable if not vital for the system in question. In view of Piaget it was not necessary to see equilibrium as different states of balance between assimilation and accommodation, he took into consideration that equilibrium is also improvement and it can lead human being to much better level of knowledge. Due to the fact that there is more valuable junction points among equilibrium states. It is called that optimization on nature of equilibration (Kohler, 2008).

Piaget claimed that children developmental stages thinking are changed from each other. And while children grow, they develop quantitatively and qualitatively. In spite of some assumptions which regard children cognitive thinking, body and mind as adult. Piaget thought that even if inborn baby is capable of thinking and learning differently from adults. In fact children especially infant and toddler can use various ways for learning and thinking (Sutherland, 1992)

According to Piaget mental growth and physical growth can’t be separated with each other. The psychology of the child is deal with both of them in developmental stages if a child hasn’t been mature mentally and physically (Piaget, 1969). Piaget divided developmental stages into four broad levels. According to him; development is continuous. These developmental stages shouldn’t be seen discrete. The aim of the separation of stages is individual differences can be evaluated and used for comparing (Wadsworth, 1996) Piaget indicated that each developmental stages is followed the other stages (Piaget, 1969).

Piaget stated that developmental stages should include important characteristics.

Stages must be: “*universal

*invariant in sequence

*transforming and irreversible

*gradually evolved

*ultimately in equilibrium” (Thomas, 2006, p. 21)

Universality’s mean is the all stages are appropriate to all members of species.

Invariant sequence; all children cross the stages same hierarchical order.
Transformation and irreversibility; when children pass through next stage, they carry out their previous stages features.

Gradual evolution; changes in stages isn’t occur suddenly, until end of the stage is regarded as completed.

Equilibrium; stability and balance; all children pass through the stages can’t be same speed.

The four main stages of development;

The sensori- motor stage

The pre- operational stage

The concrete operational stage

Formal operational stage

SENSORI-MOTOR STAGE (0-2 YEARS);

Mental development first 18 months is crucial in human life. In Infancy period symbolic function, symbolic representations don’t exist. So anything takes place of absent object and person and infant can’t talk. On the other hand during this stage, the child gains new, basic cognitive structures (schemata). New born start to assimilation and accommodation. Assimilation and accommodation can use functional by the means of sensori and motor

actions. In this stage solutions are constructed when facing sensori motor problems. The 2 year old children are more successful in inventing and doing than inborn. Sensori motor stage is divided into six sub stage (Piaget, 1969).

PERIOD 1 (0-1 MONTH) : REFLEX ACTIVITY

According to Piaget reflexes is related to responses. So in the development of reflexes environmental factors involve. In whole reflexes isn’t predictable or unchangeable. The sucking, grasping, crying movement of the arms, trunk, and head are basic reflexes in this period. There is relationship between these reflexes. For example sucking reflexes are developed through the coordination of arm, hand and mouth. Some reflexes are progressed by the repertoire of schemas of assimilation. Inborn reflexes which are sucking, palmar are jointed later intentional reflexes (Piaget, 1969). Another important reflex is searching nipple. This reflex provide later to enhance searching by accommodation. While infant using reflexes, any intellectual actions isn’t monitored (Wadsworth, 1996)

PERIOD 2 (1-4 MONTHS): FIRST DIFFERENTIATIONS

This period’s mean is modification of first period reflexes. The one of the new behaviors which is thumb, hand- mouth coordination, moving objects, eye coordination and head is act through sounds (eye- ear coordination) becomes habitual. Infant starts to understand objects differences. Indeed; infant doesn’t react other objects instead of the nipple while sucking reflex (Wadsworth, 1996).

Infant do circular reactions for reproducing own action, process of accommodation benefit from these actions which are used over and over again. Circular reactions are part of for their sake. For example; sucking thumb is preferred instead of other objects. This behavior is different from reflexes, infant act this reactions all over again. Also this period shows primary memory sparks (Sutherland, 1992)

PERIOD 3 (4-8 MONTHS): REPRODUCTION OF INTERISTING EVENTS

In progress of sensori- motor actions is come from simple habits which are primary learning experiences. But intelligence or talking can’t be observed by them. The first use of this actions sustain mediate for future habitual and intelligent reactions. Nearly four and a half months child begin to coordinate vision and grasping. The beginning of the grasping and manipulating is surrounding objects. In this period the repetition of gestures are observed. These gestures are increased by the means of feedbacks. Using holding objects attract attention of children. While changing objects, children understanding of distinguish “ mean” and “ goal” is progressed. For example using variation of objects cause attract their attention to same object, children regards this changes as a magic. And they continue to try same means for achieving different goals. The baby is aware of the own action. This process represents the entrance of the intelligence (Piaget, 1969).

PERIOD 4(8-12 MONTHS) : COORDINATION OF SCHEMATA

The first two combinations of activities are constructed in this period. The child starts to predict events and compose primitive plans. The child is aware of objects absence and start to seek in the environment. And the child

continues to play with different objects. A well known study is the “ a not b error” for infant perseveration. Between the ages of about 8 and 10 mouths of age successfully find again an object at one location (a) and then it is followed search for when it is noticeably hidden at another location (b). Infants at this age often make mistake for searching at the first location even if object is last at location b. (Wadsworth, 1996)

Children can move object for reaching the other one which is actively used for their act. Piaget gave example to illustrate this process. This is about Jacqueline use two schemata for the act. She tried to reach cigarette case but firstly she found circulated strings and pulled them so she achieve to reach the cigarette case (Wadsworth, 1996). The children haven’t tendency to achieve the same goals which are obtained previously (Sutherland, 1992)

Piaget pointed out that 7 to 8 months infants can solve simple problems. If infant want to reach a toy, s/he can attempt to pull on the cloth in order to obtain toy which is placed end of cloth (Healy, 2004).

PERIOD 5 (12-18 MONTHS): INVENTION OF NEW MEANS

In this period the baby achieve to remember the location of object. This process is called schema by Piaget. Object constancy is obtained. The baby realized the object exist even if it is not seen by s/he. The baby can construct a variety of mental pictures of object so objects are perceived by several contexts. This entrance process of comprehension is to generalize and abstract. The baby can distinguish between himself and the other objects By 10 to12 months; they can answer problems by analogy. They can establish strategy from one problem and apply it to other relevant problems. In one

study, babies were given three similar problems to overcome a barrier, grasp a string, and pull it to get an attractive toy. At first, the parent showed the solution and gave confident the infant. Babies achieved tasks. (Sutherland, 1992).

Piaget’s suggestion is the increasing of new intelligent behaviors comes from the problem solving skills. Solving sensory motor problems lead to achieve an important level of cognitive development. Problem solving ability is sign of intelligent acts (Wadsworth, 1996).

PERIOD 6 (18-24 MONTHS): REPRESENTATION

The last period of sensori- motor period is passing the next stage. The child is able to achieve new goals by means of internal groups. When a child can’t reach the goal, immediately evaluate the situation and create the new way to get over the obstacles. This final level follows through the previous levels (Piaget, 1969).

Internal representation is major characteristic of this period. Owing to mental representation child overcome the problems by means of representing objects and events without assistant of familiar or parallel experiments (Piaget, 1969).

PRE-OPERATIONAL STAGE

The pre operational stage starts inter 2 and 6 years. This stage has more advanced characteristics of children. Children’s playing and pretending is raised through the adaptation of symbols. There is a lot of evidence which children play representative objects such as pretending a broom is a horse.

Another important characteristic is role playing. While playing, children treats as a mother, father ... (Wagner, 2008). Furthermore children can represent deferred imitation (remembering the behavior and act imitation objects and events), symbolic play (children use blocks like a car while playing), drawing (represent things while performing), mental images (imitations of perceptions is thought to be symbol) and spoken language (use words as symbol in place of objects. Representation starts with first three months, but in pre operational stage, children represent formally (Wadsworth, 1996).

In this stage; preconception becomes internalize by means of learning from experiences. For instance children using spoon owing to their experiences (Wadsworth, 1996).

Piaget indicated that " transductive logic" occurs in this stage. Term is defined that pre operational child aim to construct link between mental experiences. But this link can be logically or not. In deed when 3 year old child learn a fat woman is pregnant, s/he assumed that all fat people will have a baby even if a fat man... Also in this stage children encounter some mix situations. The other essential process is " internalization". Children use their experiences by word or words. Also these words are on his/her mind verbally (Wadsworth, 1996).

Egocentrism

Toddlers aren't able to perceive others views. Child assumes that everyone thinks as the same that only his/her thought are true. Way that she does ego centric child believes thinks she/he does. His/her point of view the only fact

and unchangeable. When child faces with contradiction on his thoughts, the child who is in this stage, denies and thinks that evidence must be wrong. Child’s social and language development is effected by egocentrism (Wadsworth, 1996).

One of the well known examples for egocentric thought is “ mountain task” in which a child and doll sit opposite to each other and three mountains are shown to the child. It is expected to distinguish them by means of various features. When asking to child what the doll see. Child give answers according to his/her point of the view. This task is criticized from many aspects. These are first of all the age of child, incapable of talking, and comprehending task from child (Sutherland, 1992).

Child intends to talk with himself when someone is present, but s/he continues to talk by himself. While the child becomes 6 or 7 years old, s/he begins to far away to egocentrism. This adaptation to the social world comes from the interactions with peers and other social groups (Wadsworth, 1996).

Children’ words are depending on images more than concept. For example 3 year old can say cat when see a cat but s/he cannot classify the cats. Piaget called this process as a borrowed from adult. Child learns concepts from adult and repeated. Therefore 3 year old can’t classify cats into animals, living creatures. Another example could be about the wind. According to Piaget 3 year old can’t recognize wind in other classes such as breeze (Cohen, 1983)

Conservation of continuous quantities

This is the Piaget’s most famous experiment. The child is shown two glasses; they are filled same amount of liquid. First glass is poured into a diverse shaped cup (tall&thin, short&wide),. Children chose the wider and lover cup for deciding which one has the most liquid. Even if children be witness to amounts of liquids same , they tend to choose wider& lover cup (Wagner, 2008). Conservation of liquids is gained nearly 7 years old. Several similar experiments were done about the conservation of number, length, mass, weight, volume, and quantity. Piaget indicated that children before 5 can’t comprehend conservation (Crain, 2005).

Conservation of number

Piaget gave children a row of egg cups and a bunch of eggs. He then asked them to take just enough eggs to fill the cups. First sub stage of pre operational set the rows based on their length instead of quantities and second sub group pre operational stage children set eggs which match with each other. The reason of failure is children act based on their immediate perception; they ignore the logic (Crain, 2005).

To summarize, during the pre operational thought children make several crucial developments gains. Spoken language is used for a tool for communication. By age seven reduce monologues. They begin to prefer collective language increase. They become less self centered. Objects can exist without doing any action or intervention by children. Also children are aware of object’s changing location or shape but it remains permanent. 7 years old children can understand the universe of things. However the

perception of appearance is more dependent than logic which principle operates events (Thomas, 2006).

Play;

Symbolic play has important role in children’s life. Children are incapable of using language, they exchange ideas or discuss their thoughts and concern thanks to symbolic play (Wadsworth, 1996).

THE CONCRETE- OPERATIONS STAGE

The level of concrete operations stage is about age seven to age eleven. Children start to perform operations with objects. Children use various kinds of objects. Concrete means that the problems involve identifiable objects that are either directly perceived or imagined. In concrete- operations period, children achieve to search more objects and transformations and expert mental operations can be used. In this period children have ability to conservation and reversibility. They are able to recognize give attention to particular two and more aspects of events (Thomas, 2005).

Construction of logical operations is major point in children’s’ cognitive development in concrete operational stage. All cognitive structures which are assimilation and accommodation generate logical operations. Logical operations are constructed by organizing experiences (Crain, 2005). Children begin to classify color or construction material differently. They don’t only deal with their color or material. They are capable of classification depend on criterion such as size or number. The child can understand transformation. In fact children can pay attention to first state and last state of an object while

transformation. For instance; typical pre operational children at age three and four years old is expected to compare the 5 small ball and whole original large ball according to clay. This age group can’t comprehend that both of them includes same quantity of clay. They assumed that five small balls are more than large ball. On the other hand; by age six or eight, children realized the quantity is unchanged (Thomas, 2005).

Mentally reversible transformations can construct logical links between several aspects of phenomenon (Kohler, 2008). The complex systems like family members and their relations can be understood their relations children aren’t confused about who like whose brother. If they see pink cows are more than green cows, they can make comparison pink cows must be fewer than green cows. Also they can perceive objects initially. If a horse is belonged to mammal, all horses are belonged same group. At 8 or 9, the child comprehends differences between some and all, part of and whole, more and less for mathematics comprehension is advanced. Children can see 3+2 is equal to 2+3. Also while separating whole from parts, they can generalize objects according to their diversity. For example; people who are black, yellow, and red, white become all human (Cohen, 1983).

Classification;

In classification studies, children are expected to match set of objects (shapes, size, and color). This includes three levels. First 4 or 5 years children select objects according to similarities (shape, color, size) and ignore their differences. For example children put white triangle and grey triangle or white triangle and white circle together. In second level; through

age 7, they can classify objects according to one aspect. For instance; objects can be separated by only shapes. Criterion of classification is changed depend on purpose of classification. But children are lack