

*Full Length Research Paper*

# **Piaget's theory of intellectual development and its implication for instructional management at pre-secondary school level**

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**Instructional management focuses on planning, execution and evaluation of learning experiences. For teachers in pre-secondary schools to plan, execute and evaluate learning experiences effectively, they need to have good understanding of the process of cognitive development in children. Piaget has postulated that children progress through a series of four stages beginning with rudimentary reflex responses and achieving full maturity with the attainment of formal deductive reasoning. Piaget's theory also postulates that a child is an active investigator who acts upon his environment with reflex responses during infancy and then with more complex responses that emerge from early interactions. Piaget views interaction as a two-way process, one of which is accommodation and the other is assimilation. In accommodation the child's knowledge of the environment is modified to incorporate new experiences which are adaptive to the broad aspect of cognitive demands imposed by the environment. In assimilation, the child incorporates new experiences into an existing structure. Accommodation and assimilation are reciprocal and their interaction generates cognitive growth. Understanding and application of Piaget's Theory is important in the effective enhancement of teaching and learning process at pre-secondary school level. Consequently, teacher trainers, trainee teachers and practicing teachers need to keep abreast of Piaget's theory of intellectual development.**

**Key words:** Intellectual development, Instructional management and Pre-secondary schools.

## **INTRODUCTION**

Jean Piaget's theory of intellectual development (Flavell, 1963) is considered a leading theory on cognitive development (Flavell, 1963). Piaget's theory asserts that intellectual development is a direct continuation of inborn biological development. That is the child is born biologically equipped to make a variety of motor responses, which provide them with the framework for the thought processes that follow. That is, the ability to think springs from the physiological base. Piaget maintains that intelligence is rooted in two biological attributes found in all living creature: organization and adaptation. Organization is the tendency of every living organism to integrate processes into coherent systems. It occurs, for instance, when an infant, originally capable of either look-

ing at objects or grasping them, integrates these two separate processes into a higher order structures which enable him to grasp something at the same time he looks at it. Adaptation is the innate tendency of a child to interact with his environment. This interaction fosters the development of a progressively complex mental organization.

Each stage in this sequence of development provides the foundation for the next stage permitting progressively complex and effective adaptations to the environment. Adaptation comprises two complementary processes of assimilation and accommodation. The child assimilates experiences and fits them into the expanding structure of the intellect when he encounters new experiences which he

cannot fit into the existing structure accommodation, or modified way of reacting takes place. Piaget stresses that as children mature mentally, they pass sequentially through four major stages of cognitive development, each stage having several sub stages (Hertherington and Park, 1975). The major stages of cognitive growth are:

1. Sensory motor stage - 0 - 2 years
2. Preoperational or intuitive stage - 2 - 7 years
3. Concrete operations stage - 7 - 11 years
4. Formal operations stage - 11 - 15 years

These stages are of a probabilistic nature. At most ages it is possible for a child to exhibit behavior characteristic of more than a single stage because heredity interacts with environment. Each stage is a system of thinking that is quantitatively different from the preceding stage. Each stage is a major transformation in thought processes compared to the preceding stage. The stages are sequential and follow an invariant sequence. This means that the child cannot skip or miss a stage or by-pass a stage. He must go through each stage in a regular sequence. Children cannot overcome a developmental lag or speed up their movement from one stage to the next. They need to have sufficient experience in each stage and sufficient time to internalize that experience before they can move on.

## **MENTAL DEVELOPMENT OF CHILDREN AT VARIOUS STAGES AND THEIR IMPLICATIONS FOR INSTRUCTIONAL MANAGEMENT**

### **Pre-school (sensory motor) 0-2 years**

During this stage, cognitive activity is based on immediate experience through the senses (Meyer and Dusek, 1979). The major intellectual activity here is the interaction of the senses and the environment. Children have not developed a language for labeling experiences or symbolizing and hence remembering events and ideas. They therefore see what is happening and feel it, but they have no way of categorizing their experiences. Responses are almost completely determined by the situation. For example, a hungry child will literally scream the house down for food. It does no good to tell a six month – old, “now just a moment”, I am warming your milk. The child has no way to represent the idea that in one or two minutes, nice warm milk will appear in a bottle. He obviously does not know what a minute is or what any of those other words mean.

During this stage a phenomenon known as “visual pursuit” is manifested. The child will visually pursue an object relentlessly, long after an older child would have lost interest. Such visual pursuit develops the capacity of “object permanence”, a primitive form of memory (Meyer and Dusek, 1979). As children begin to develop intellectually, they understand that when an object disappears from view, it still exists even though they

cannot see it. This implies that day-care centers should operate quality programmes that guarantee a rich and responsive sensory environment. This in effect should be directed to nurturing the innate faculty of intellectual development. It also means that daycare center managers should be knowledgeable in balanced nutrition matters.

### **Nursery school (pre-operational or intuitive): 2-7 years**

During this stage intuitive mode of thought prevails characterized by free association, fantasy and unique illogical meaning. The child can symbolize experience mentally. This is facilitated by the development of language skills (Meyer and Dusek, 1979). He uses egocentric speech. Children often talk at, rather than to each other in what Piaget calls collective monologues. The child learns to associate words and symbols with objects. He develops an awareness of the conservation of mass, weight and volume.

Since the nursery school child has to solve new problems on the basis of a limited past experience, he is likely to encounter contradictions as a result of faulty generalizing (Meyer and Dusek, 1979). When faced with such contradictions, a child at a lower level of development usually shrinks from them but a child at a higher level may become disturbed.

This is illustrated by the experiments in which children watch someone pouring colored water back and forth between a 200 ml beaker and a 500 ml beaker. A four year-old may be totally unconcerned about the fact that the water level differs in the two containers. He will simply maintain that the beaker with a higher level has more colored water. A somewhat older child, however, may become upset about this discrepancy between what he expected and what he sees eventually. After a few months of maturation and experience the child will be able to comprehend why the water level is different. The beaker experiment illustrates conservation, the principle that certain properties are conserved or remain constant, regardless of changes in appearance. The child's earliest conservation is that of mass.

If a four year old is shown two coloured plasticine balls of the same size and then one of them is flattened as he watches, he is likely to say that the flattened one contains more plasticine. By age five, most children are able to comprehend that even though the shape is different; the mass is the same (O'Bryan and Boersma, 1971).

If a nursery school teacher places balls on a weighing machine to show that they are the same weight and then flattens one ball, only an older nursery school pupil is likely to predict that they will still balance. However, if the teacher drops the two plasticine balls into equal amounts of water in graduated cylinders and then flattens one, probably not even the oldest child in nursery school will be able to predict that the water level will be raised to the

same level by both the round and elongated balls of plasticine (Meyer and Dusek, 1979)

Piaget (1952) points out that until the child has developed a one to one correspondence, he does not have the foundation for learning the concept of number. The child must grasp the principle of conservation before he can comprehend the concept of number. The understanding of number is based on the awareness that cardinal numbers are invariant regardless of the other factors. Understanding the concept of number requires more than the ability to count. For instance, if any nursery school teacher gets six oranges and four bananas, and asks his pupils to count them. He needs to ensure that they understand that both oranges and bananas are called fruits. He then asks which are more? the oranges or the fruits. Chances are that most nursery school children will answer "oranges".

The teacher should ensure that the curriculum for nursery school pupils should be one that encourages the teacher to talk a great deal to children, read to them, and teach their songs and nursery rhymes. The teacher should also provide a dialogue time in which children have a natural opportunity for talking. Many should be helped to become good listeners. It may be necessary to provide talking opportunities between the loquacious and silent extremes. Ways of avoiding wrong dialogue should be devised, for example a vivid account of a fight between a child's parents.

The teacher should encourage imagination and inventiveness in his pupils as much as possible using play, story telling and painting (Flavell, 1977). Some children may be so imaginative that they fail to distinguish between what is real and what is make-believe, a factor that can lead to adjustment problems. This can be overcome by either the teacher encouraging his pupils to tell stories during story-time but not during the rest of the day, stressing that while it is wonderful to be able to make up stories, sometimes it is necessary to describe exactly what happens.

### **Lower primary school (concrete operations) 7-11 years standard I, II, III and IV**

The two basic objectives for a curriculum at this stage are:

- a) The child should be able to learn fundamental skills in reading, writing and calculating arithmetic problems.
- b) The child should be able to accept his own aptitude for school.

The lower primary school child is at the stage of concrete operations. The child here is concerned with knowing only the facts and therefore becomes confused when faced with the relative, probabilistic nature of human knowledge. The switch over from egocentric to socialized

speech takes place at about class two. Comprehension of the principle of conservation permits children to grasp the concept of number. This enables them to use cardinal numbers: 1, 2, 3, 4 which are invariant regardless of whether they apply to oranges, bananas or fruits. They are also able to use ordinal numbers; 1<sup>st</sup>, 2<sup>nd</sup>, 3<sup>rd</sup>, 4<sup>th</sup>, the child can handle situations that require adding to and subtracting from. Understanding of the concept of ordinal numbers permits the child to classify objects in many ways, according to their various quantities; such as size and weight. The ability to order objects, that is, to arrange them in various series according to different criteria, illustrates the process of decentration. Decentration (Elkind, 1969) means that the child does not center his thinking on just one aspect of a subject or object or material but on two or more dimensions at once (Anita, 2004). This explains why an older child can solve conservation problems; for he can take into account size and weight or size and volume simultaneously. Decentration also permits the child to grasp the concept of reversibility. The child can comprehend that pouring water from the tall and the short beakers back into the original containers restores it to the original condition. The children can combine the various parts to make a whole and can even consider and reason about the various parts and the whole object at the same time and the concepts and the ability to manoeuvre them in the mind. The child's considerations are built up from using concrete materials, but are independent of the actual material used. At this stage the child is eager and excited to learn. The teacher should therefore take the advantage and make use of the extreme eagerness to learn demonstrated by the pupils.

Children should be provided with concrete materials that can be made up into different collections according to different criteria. For instance counters, sticks and so on. Abstract concepts and ideas need to be presented very concretely (Anita, 2004). Children may be allowed to examine freely as many relations as possible among various variables in a learning situation. Since children prefer to talk and have much more facility in speech than in writing, they should be given opportunities to recite in class whether they know the right answer or not. However, the teacher should control class participation, so that pupils speak up only when called upon. This should provide a chance to all pupils and ensure that listening skill is also embraced. The teacher should reinforce pupil participation by using appropriate reinforcement cues, even if the answer is erroneous or irrelevant.

Upon discovering the power of words, many children may experiment with vulgar language. They know that they get a reaction although they do not understand exactly why. The teacher should first ignore the vulgar language in the hope that it will be dropped from lack of reinforcement. Alternatively, the teacher may have a short talk with the ringleaders or he may state that such words

are not pleasant to listen to and are not to be used.

At this stage, concepts of right and wrong begin to develop. Usually these are concerned with specific acts at first and only gradually become generalized. The idea of fairness becomes commonplace. To help children at this level gain a broader understanding of ethics, the teacher should discuss acts as they occur. He should do this by encouraging the pupils to think about why an act is good or bad. Children at this level are still moral realists, having difficulty comprehending the subtleties involved in various situations. If some pupils seem to be upset about what appears to be an inconsistency, the teacher might try to point out the circumstances which made necessary an adjustment in rules. Since the child sees rules as absolute, good judgment must be exercised by the teacher to prevent manipulation of the child's literal interpretation of rules. It is important that situations that permit social interaction should be always arranged. Advanced thinkers should be mixed with less mature thinkers, rather than using homogeneous grouping. The planned learning experiences should take into account the level of thinking attained by an individual or group.

Children should be encouraged to classify things on the basis of a single attribute before they are exposed to problems which involve relationships between two or more attributes. The teacher should ensure that pupils, particularly those with disadvantaged backgrounds understand such terms as "more", "less", "most" and "least".

### **Upper primary (formal operations) 11-15 years: standards V, VI, VII and VIII**

At this stage the child shifts from the level of concrete operations to the final stage of formal operations. He is capable of considering the ideas of others and communicating with them, since he is well into the socialized speech phase of language development.

The development of adult patterns of thought involving logical, rational and abstract thinking characterizes this stage (Piaget, 1952). To concretize, pupils develop the ability to reason by hypotheses based on logic of all possible combinations. When the student has reached the stage of formal operations, he can construct theories and make logical deductions about their consequences without having had previous direct experience on the subject. He can deal with abstractions and mentally explore similarities and differences because he has mastered reversibility and decentration. He can think his way through understanding that the sweetness of water, when sugar is added, depends on the amount of water. At new problems, moving forward and backward, taking into account as many or as few qualities as seen relevant to him. In other words, new operational schemata appear capable of such tasks as: - combinational operation in general (combinations, permutations, aggregations);

proportion; mechanical equilibrium; understanding that the sweetness of water when sugar is added depends on the amount of water. At this level, the teacher should capitalize on children's almost incessant curiosity. Pupils can be encouraged to find answers themselves rather than the teacher always supplying them. However, if this is overdone, it can kill interest. A child who happens to know more or better than the teacher should be encouraged to contribute. Shifting from one interest to another does not necessarily mean lack of mental discipline (Anita, 2004).

Many upper primary students do set unrealistically high standards for themselves and tend to be perfectionists frequently. The inability to live up to such standards leads to feelings of frustration and guilt. Pupils should be taught to develop realistic levels of aspiration by having them start out doing simple tasks and working up to difficult ones. In doing so, such pupils do not only test their capabilities but also have some experience with success. The latter makes it easier for them to accept failure when they reach their limits. Upper primary children want to become independent, but at the same time they both want and need adult guidance and support. This ambivalence may cause disorganized, unpredictable, or in appropriate behavior which defies rational analysis. The teacher has to be as patient and understanding as possible when erratic behavior occurs. Since pupils at this level will at times function in concrete operations and at other times in formal operations, plenty of opportunities for all should be provided. These should be those that enable pupils to explain their thoughts, particularly with regard to abstractions. The teacher will thus be able to discern and take into account the level of awareness his pupils have reached on various ideas.

The students, particularly in classes 7 and 8, should learn to accept his abilities and talents. In these classes, such concepts as democracy, African socialism, may be introduced. Some students may come up with twisted interpretations of abstract concepts. To clarify such, the teacher has to be patient, sympathetic and open minded, and not to ridicule or categorically reject students' errors.

Although the attention span of upper primary students can be quite lengthy, there may be a tendency to daydream. Such detours into fantasy and dreams of glory probably take place because the students lack the real thing and also because their opportunities for excursions into fantasy are limited. To overcome this, students should be given assignments which challenge the imagination in as many ways as possible. Intriguing puzzles or problems should be presented as opposed to tedious drills (Anita, 2004). Assignments on themes like 'The kind of animal I would like to be if reincarnated' rather than on 'my pet,' useful dreams about the future – involving for example the kind of job the student might like, what is involved in getting the job, are also suggested.

The teacher should not take for granted the fact that

students at this level are thinking in the same way as he is thinking. He should try to be well informed on how his students interpret ideas which come up in class by encouraging free discussion. He should also watch for the tendency of the adolescent to indulge in unrestrained and unrealistic political theorizing. The teacher may handle such immature forms of thinking by helping students realize that they have overlooked certain considerations.

## **DISCUSSION OF THE IMPLICATIONS OF PIAGET'S THEORY OF INSTRUCTIONAL MANAGEMENT**

Piaget's theory of cognitive development has far reaching implications for curriculum development, planning, implementation, evaluation and instructional management in schools. His levels of cognitive development may be used as broad and general guides to sequential curriculum planning. Curriculum planning revolves around the subject matter, the society and the learner. If we choose the subject matter to be our orientation in planning, then the structure of the content should be a sequence that is compatible with child development characteristics. Also, if society is chosen as the basis of the orientation of planning, then the content selected and organized should be around pertinent life situation confronted by students. When the orientation has the learner as a basis, then we must consider his interests, felt needs, basic urges or drives and concerns as he grows through the various stages. Thus the curriculum and instructional manager should be one that is diversified to call for the needs and interests of the many learners of varying ages, and abilities, which are found in the school. The objectives stated at the cognitive level, psychomotor and affective levels must reflect the different stages of the learner's growth. The scope, sequencing and integration of the subject matter have to relate to the learner's cognitive growth.

The teaching methodology and teaching materials, and the learning activities should be those that are appropriate to each of the cognitive developmental stages of the learners. Since the theory says that there is a mutual interaction between the learner and the environment, teaching materials should come from the learner's environment.

Teachers as instructional managers should use the hierarchy to: understand why children think and reason as they do; and to help the pupils master intellectual processes at the appropriate age. Children at various ages have different capacities for attention and comprehensive (save for a few lessons in physical education and the appreciation of aesthetic). This means for instance that a standard one pupil may not endure a seventy minute double period as would a standard seven. The theory clearly mandates that teachers as instructional managers should ensure that the learning

environment should be rich in physical (concrete) experiences because growth in any one stage depends upon activity. Indeed Piaget calls for an active school involvement, which is a key to intellectual development, and should include direct physical manipulation of objects. The child must touch, sequence and push to experience and understand his environment.

The curriculum, instructional and assignments developer should make a special effort to understand the child's world. They should not assume that what they think is good for the child is necessarily good for the child. They can then design educational experiences based on the child's need and readiness. By understanding how cognitive systems develop, they can avoid teaching children something before they are ready to learn it and missing a golden opportunity by waiting until well past the most sensitive moment.

Rather than trying to accelerate "slow learners" in order to catch up, educators should provide children with rich experiences at their stage of development. Teachers should use diagnosis to determine a child's stage of development and then design individualized instruction to provide the optimal amount of stimulation and challenge. In a Piagetian framework, an acceleration approach may result in superficial learning and not real learning. The former is acquisition of facts or responses restricted to a specific situation. The child thus learns laws for specific situations. He may correctly respond to a particular situation, but will be unable to generalize in novel situations.

Acquisition of a new structure of material operations (real learning) results from the equilibration process. Piaget demonstrates that this type of learning is the only stable and permanent one. It is only when the child has acquired the mental structure to assimilate new experiences that true learning takes place. It is only when the true learning has taken place that the child is able to generalize to novel situations. When the child has acquired the essential cognitive structures (schemas), he can begin to understand reality; but when the child does not have the schemas; new experiences have only a superficial effect. Therefore, unlike Bruner, Piaget feels that development does not occur as a result of learning, but true learning occurs primarily as a result of development. Thus, the curriculum developer should strive to present those experiences and materials that are relevant to what the child knows and then expose him gradually to novel situations.

Piaget believes that the equilibration process is the driving force in influencing the person to move from one level to a higher level of cognitive development. Social and physical environments can be modified to influence equilibration. A stimulating environment plays an important role in the manifestation of cognitive ability because it will provide disequilibrium, thus forcing the mind to assimilate new information and formulate new schemes. Understanding of the equilibration process will guide

curriculum developers and instructional managers in their interaction with children. Teachers should not provide children with information and expect an immediate response or change in behavior.

Piaget cautions that assimilation and accommodation take time. It should be remembered that the child may be involved in some activity today, but the change in his schemes may not occur until sometimes in the future when he has had further experiences. These experiences may provide further information and clarification to make the accommodation process possible. This implies that the child should be allowed to “mess up” or to do “his thing”.

Piaget's theory is important in evaluating curriculum. He argues that teachers should understand that each individual child's cognitive development does not occur quickly and little, if any progress, may be assessed on a weekly or even monthly basis. They must not think that because something has been presented, it has been learned. He advises us to show care when presenting answers to children before they have had the chance to accommodate. His research suggests that children need time to “incubate ideas” in order to act on them. They should be given time to understand the school world which is different from the home world.

To assess the progress towards the attainment of the objectives of the curriculum that the teacher has to, at any time he chooses, focus his attention upon an individual child or small groups of children. In assessing pupils' program, the teacher should be guided by such questions as: - How little or how much of the curriculum does a pupil know at the beginning of the school year? What changes occur in the behavior of the pupil during and at the end of the school year? what are the individual learner's interests, aptitudes and achievements – at the

beginning, during and at the end of the instructional programme? And how effective are instructional methods for each individual learner? In a nutshell, Piaget emphasizes social interaction. Children must be involved in the learning process, that is, learning should be child-centred.

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