

## Unit–3

# INTELLECTUAL DEVELOPMENT

### 3.1 OBJECTIVES

At the end of this unit, students will be able to:

1. discuss intelligence and how is it measured
2. discuss theories of multiple intelligences
3. review the controversies and issues in intelligence
4. understand the intellectual characteristics of learners
5. work out activities relevant to children's intellectual development at pre and elementary school level

### 3.2 OVERVIEW

*Cognition* is the study of the thought processes or activities of human mind which lead to the acquisition of new knowledge and skills. It includes all types of mental processes such as attending, thinking, visualizing, imaging, creating, and problem solving to name a few. Human cognition is an extensively large area of study which includes an array of topics such as memory, attention, social cognition, reasoning, and problem solving.

While cognition is the process of thought or knowing, *intelligence* refers to the process of applying that thought or knowledge into real life. In this way, intelligence involves both the process of assimilating knowledge (cognition) as well as the ability to apply knowledge. This is why some psychologists tend to encompass cognition within intelligence. However, the use of these terms varies across disciplines as well. For example, a cognitive scientist would refer to *cognition* from an information processing perspective, whereas a social psychologist would refer to the same process as *social cognition*. The terms cognition and intelligence are also used synonymously. However, although cognitive abilities (e.g., thinking, problem-solving) and intelligence are closely linked, they are not exactly the same. Cognitive abilities can be trained and improved under certain conditions, whereas intelligence generally refers to a relatively fixed and measurable trait. Overall, cognition emphasizes the mental processes, for example, thinking etc; whereas, intelligence refers to the product of mental processes.

This unit specifically focuses on intelligence and intellectual development in children. There are several explanations about how does cognitive development occur in children (e.g., Piaget's cognitive developmental theory, Vygotsky's socio-cultural theory, information processing approach), which emphasize the processes rather than the product of thinking. However, the psychometric approach to cognitive development emphasizes the products of mental processes, such as, intelligence and its scores.

This unit introduces us to the concept of human intelligence, how is it measured, and how does intellectual development occur from infancy to childhood. It also examines the intellectual characteristics of learners and float some ideas about how can we engage children in age-appropriate activities to support their intellectual development.

### **3.3 DEFINITION OF INTELLIGENCE**

The term *intelligence* has been described differently by different experts with little agreement over what factors or dimensions comprise its structure (Berk, 2013; O'Donnell, Reeve, & Smith, 2012; Woolfolk, 2014). This is because it is an abstract and broad concept which is not directly measurable like some other human traits such as height, weight etc.

Generally, intelligence is thought of a combination of different attributes, for example, the ability to solve problems and adapt and learn from experiences, creativity, and interpersonal skills. Although many experts agree that intelligence has several characteristics, there is a little consensus about the nature of these characteristics. Similarly, some agree that these characteristics are closely related to each other; whereas others argue that they are distinct features. Besides, some view intelligence as a single capacity while other believes that it is a collection of loosely related abilities. These varied beliefs have influenced the theoretical positions as well as the measures of intelligence.

#### **3.3.1 Theoretical positions**

There is a continuous debate among psychologists about whether intelligence is composed of a single capacity or a number of specific capacities. Spearman suggested that there is a *general ability or intelligence (g)* which is responsible for an individual's overall success in different tasks. For example, people who have good memory and information processing mechanisms are likely to perform better at problem solving tasks. Overall, general intelligence includes abstract thinking or reasoning, the capacity to acquire new knowledge and problem solving ability. However, other theorists argue that individuals have more than one specific ability, and thus view intelligence as multifaceted.

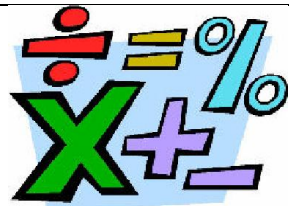



##### ***i. Triarchic theory of intelligence.***





Robert Sternberg proposed that intelligence is composed of three basic components including analytical, creative and practical components. The analytical component deals with a person's ability to solve problems by analyzing ideas and thinking critically. Creative intelligence refers to the ability to combine different ideas to form something novel by thinking outside of the box. Whereas, practical intelligence involves applying knowledge and skills into different kinds of environment. Based on the triarchic theory of intelligence, Sternberg further argued that *successful intelligence* brings success to one's life within one's own goals and contexts.

**ii. Gardner's theory of multiple intelligence**

In contrast to the view that intelligence is composed of a single or a small number of overarching abilities, Howard Gardner suggests that an individual may exhibit several types of intelligences. He categorized these intelligences into eight identifiable forms and argues that there could be possibly more than these forms. His list of intelligences includes the following: logical-mathematical, linguistic, spatial, musical, bodily-kinesthetic, interpersonal, intrapersonal and naturalistic. This is further elaborated in Table 3.1 as follows.

**Table 3.1**  
Gardner's Multiple Intelligences

<b>Intelligence</b>	<b>Characteristics</b>	<b>Related activities</b>	
Logical-mathematical	Ability to understand and use numerical patterns, mathematical operations, reasoning and logic	Experimenting, calculating, solving logical puzzles etc	
Linguistic	Ability to acquire and use functions of language, express oneself and comprehend others	Reading, writing, playing word games, listening to and telling stories etc	
Spatial	Ability to understand, recognize and manipulate patterns, spaces and objects	Navigating, designing, visualizing, drawing, solving jigsaw puzzles etc	
Musical	Ability to appreciate and use the components of music	Singing, creating tunes, humming etc	

Bodily-kinesthetic	Ability to coordinate and use fine- and gross motor skills in a productive way	Dancing, running, cycling, swimming etc	
Interpersonal	Ability to interact with others in a productive way	Leading, organizing, socializing etc	
Intrapersonal	Ability to appreciate one's own self to guide one's own life	Goal-setting, organizing, planning, dreaming, meditation etc	
Naturalistic	Ability to appreciate the natural environment	Understanding, working with and caring for mother nature etc	

Gardner's theory of multiple intelligence has been warmly received in the educational community since it gels well with the notions of individual differences among learners and teacher's experiences about how children learn (Woolfolk, 2014). However, it is criticized that there is a lack of a specific criterion as well as empirical evidence to support the conceptualization of intelligence by Gardner.

**iii. Emotional intelligence.**

Both Gardner and Sternberg emphasize the abilities to understand one's own self and others (e.g., interpersonal, intrapersonal and practical intelligence). Contemporary theorists show considerable interest in students' emotional intelligence which enables them to understand emotions and emotional knowledge, express emotions appropriately, monitor their own and other's emotions and feelings, and allow emotions to guide their thinking and actions. However, they are criticized for broadening the concept of intelligence without adequate research based evidence.

**3.3.2 Issues and controversies**

One of the greatest controversies in the area of educational and developmental psychology is whether intelligence is an inherited ability (nature) or whether it can be developed by an individual's personal and contextual experiences (nurture) (see O'Donnell, et al., 2012)? Early psychologists view intelligence as an inherent and fixed

capacity which cannot be altered. This view is referred to as an *entity view of intelligence*. However, others argue that context plays an important role in developing intelligence and it can be improved with practice and a supportive environment. This view is known as the *incremental view of intelligence*. The incremental view of intelligence is popular with the teachers and educationists, who believe that students' intelligence and performance can be improved under supportive circumstances.

### 3.4 MEASUREMENT OF INTELLIGENCE

A number of standardized tests have been used to measure intelligence. Although these tests give information about a rather narrow range of an individual's capabilities, they are popular with psychologists and educators because they provide a reasonably fair picture of future success. Generally, intelligence tests have been divided into two broad categories, including the individual and group intelligence tests (see Berk, 2013).

#### 3.4.1 Individual intelligence tests

The *Stanford-Binet* test and the *Wechsler* scales are the two most commonly used individual tests to measure intelligence.

Alfred Binet constructed a measure of intelligence in response to the French government's call in 1904. He developed the concept of *mental age* (MA) which represents a child's mental development in relation to the other children. His test consisted of 30 items to assess mental processes and behaviors. Later, in 1912, William Stern introduced intelligence quotient (IQ), which represents an individual's mental age (MA) divided by chronological age (CA) multiplied by 100.

Binet's test has been revised and adapted several times. In 1916, it was adapted for use with the English speaking children at the Stanford University, and named as the *Stanford-Binet Intelligence Scale*. The latest version of Stanford-Binet Intelligence Scale takes into account general intelligence along with complex mental processes including fluid intelligence, knowledge, quantitative reasoning, visual-spatial processing and working memory. This test is successfully conducted with individuals ranging from 2 years to adulthood. A special version of the test, named, the *Stanford-Binet Intelligence Scales for Early Childhood*, includes less items with verbal and non-verbal mode of testing for children aged between 2 to 7.3 years.

Another commonly employed intelligence test is called the *Wechsler Intelligence Scale for Children IV* (WISC-IV). It targets the children aged between 6 to 16 years and offers a measure of both general intelligence as well as other intellectual factors such as verbal reasoning, perceptual reasoning, working memory and processing speed. Besides, an age-appropriate version is also available for children aged between 2.6 years till 7.3 years, and is referred to as the *Wechsler Preschool and Primary Scale of Intelligence- III* (WPPSI-III).

Furthermore, *aptitude* and *achievement* tests are also used as indicators of an individual's intelligence. Aptitude tests refer to the person's potential to perform a particular task in future, whereas achievement tests assess the actual knowledge and skill of the person.

While the above mentioned tests provide appropriate measures for children and adults, there are special tests which are designed to measure the infants' intelligence as well.

These include, for example, the *Bayley Scales of Infant and Toddler Development*. These scales are suitable for use with infants as young as one month old up to 3.5 years.

### 3.4.2 Group intelligence tests

A rather quick and cost-effective way of measuring students' intelligence is to conduct the test in a group. This helps to reduce the related expenses and saves time. There are tests that are specifically designed for this purpose, for example, the *Lorge-Thorndike Intelligence Test* and the *Otis-Lennon School Ability Test (OLSAT)*.

However, group intelligence tests should be used with caution since they have certain limitations. For example, they do not allow the examiner to develop rapport and determine the students' level of anxiety. It is generally suggested that the scores obtained from group intelligence test should be supplemented with the information from other

#### Check your knowledge/understanding

1. The ability to adapt and learn from one's experiences is referred to as:
  - a. wisdom
  - b. intelligence
  - c. creativity
  - d. adaptability
2. Ali's mental age is 12, whereas his chronological age is 10. What would be his intelligence quotient IQ?
  - a. 100
  - b. 110
  - c. 120
  - d. 130
3. Both Sternberg and Gardner argue that:
  - a. intelligence is a general ability
  - b. there are three types of intelligence
  - c. intelligence is exhibited by several specific abilities
  - d. intelligence is composed of a single capacity

Answers. 1. (b) 2. (b) 3. (c)

sources.

### 3.5 INTELLECTUAL DEVELOPMENT FROM INFANCY TO CHILDHOOD

Children gain cognitive maturity as they age. With time and experience, they advance their thinking skills and make transitions from simple to complex cognitive processes which add to their intelligence as well. This section emphasizes the processes (cognition) rather than the products of mental activities (intelligence). It examines how

do children make cognitive and intellectual advancements from infancy to childhood. In doing so, it also highlights the cognitive characteristics of learners at different periods of time.

### **3.5.1 Piaget's theory of cognitive development**

Piaget believed those children's cognitive development progresses through four stages which involve sensori-motor, preoperational, concrete operational, and formal operational periods. These stages are treated as fixed and universal and represent a general sequence which is observable in all types of cognitive change.

Piaget argued that children's thinking and the ways through which they make sense of their experiences (schemes) change with age. The infancy period is marked by sensori-motor action patterns during which a child acts on the objects around him/her to form *schemes*. Soon, he/she begins to form mental images which help to transform thinking and experiences into meaningful, manageable and memorable patterns. This transformation in thinking is supported by two critical processes including *adaptation* and *organization*. Adaptation involves the process of developing schemes by directly working upon the environment through *assimilation* or *accommodation*. However, if the balance between these two is disturbed, it causes a cognitive conflict or *disequilibrium* within the minds of children. It is important to resolve the conflict through either assimilation or accommodation to bring the mind back to the *equilibrium* state. These resulted in developing more effective schemes that help the child to advance his/her thinking.

#### ***i. The sensori-motor stage.***

The *sensorimotor* stage is characterized by the first two years of life during which infants *think* through their five senses. At the beginning of this stage, the sensory *reflexes* of the child serve to make up for his/her intelligence. The child engages in *circular reactions* (repeating chance behaviors) which help him/her to adapt to his/her surroundings. Later, the child deliberately employs intentional or goal directed behaviors by coordinating different schemes to solve simple problems. Object permanence (the ability to understand that objects exist even when they are not seen) emerges towards the end of this period which helps to set the stage for *mental representations* and engage s the child in *make-believe play*.

#### ***ii. The preoperational stage.***

As children grow, they enter in the *preoperational* stage (2 to 7 years) which characterizes their immense *representational* or *symbolic* capacities. Children make advancements in their mental representations as they develop more effective schemes. For example, as they get past the first two years of their life, their make-believe play gets more sophisticated. This cognitive change is seen when a child older than 2 years of age pretends to use an object (cup) in different ways, for example, using it to drink water as well as using it as a hat. Similarly, children's drawings get more mature, realistic and detailed during the preschool years. However, their expanding cognitive capacities are limited by their inability to take into account someone else's perspective, referred to as *egocentrism*.



**iii. *The concrete operational stage.***

The *concrete operational stage* extends from 7 to 11 years. As the children enter the middle childhood, they accomplish a number of cognitive advancements. For example, children at this stage perform mental operations that follow logical rules. They are capable of thinking in more than one direction and are capable to see a problem from different angles (*decentration*). Consequently, they understand that certain characteristics remain the same even if they change the outward appearance (*conservation*). Their understanding of space is more precise when compared with the preschool children. They are capable of developing logical hierarchies and classification systems and can perform reversible actions which demonstrates that the children have now developed logical, flexible and organized schemes than before.

**iv. *The formal operational stage.***

Children develop the capacity for an abstract and systematic thinking around 11 years of age. Piaget referred to this stage as *formal operational stage*. While the children can perform operations with the real objects at the concrete operational stage, they are now ready to perform mental, abstract operations without any concrete things or events. The main features of this stage include *hypothetical -deductive reasoning* and *propositional thought*. These abilities refer to the children's capacity to form and evaluate logical propositions without referring to the real world circumstances and systematically reaching a conclusion. Accompanying this stage, comes the individual's desire to get noticed, often referred to as *adolescent egocentrism*. This is a heightened self-consciousness phase in which the growing adolescents tend to believe that others are interested in them in the same way as they are themselves. This state causes irresponsible and uncontrolled behaviors often leading to suicide attempts, negative thoughts, and drug use etc.

Although Piaget's theory presents a comprehensive explanation of how does cognitive development occur in children as well as highlights the characteristics of learners at different stages of cognitive development, it has not gone without criticism. One of the major arguments raised against Piaget's theory is that he has underestimated the role of culture, language, and environmental influences while explaining children's cognitive development. The next section presents Vygotsky's socio-cultural approach which takes into account these important influences.

**3.5.2 Vygotsky's socio-cultural theory**

Lev Vygotsky's socio-cultural approach builds upon the role of language and cultural tools in shaping up human cognition and development. He believed that the cultural influences, such as, language, instruction, and social interactions etc have a profound influence on children's cognitive advancements. He introduced the concepts of the *zone of proximal development (ZPD)* and *scaffolding* to demonstrate how do children move from one to another level of cognitive progress. ZPD refers to certain cognitive abilities that are in the process of developing, and that can be achieved with support from an adult or a capable peer. Whereas, scaffolding allows to adjust level of support according to the learner's needs and performances. While Piaget focused on the individual learners with a strong emphasis on the stages through which they pass during cognitive

development, Vygotsky argued that social interactions, cultural tools and collaborative processes set the stage for higher level cognitive processes.

### 3.5.3 Information processing approach

Information processing approach presents another major perspective which helps us to understand cognitive development. This approach views human brain as an active information processing system, like a computer machine. It examines how does information enter a human mind, and how is it stored, processed and retrieved when needed. It emphasizes two major cognitive processes including *memory* and *thinking*. Overall, it is argued that children develop and refine their mechanisms to acquire, process, store and work with increasingly complex information and skills over time. In doing so, they develop improved *cognitive resources*, that is, the capacity and speed of processing information. This improved ability is further linked to better memory and problem solving skills.

#### Check your knowledge/understanding

4. According to Piaget, when do children start to exhibit object permanence?
  - a. sensorimotor stage
  - b. preoperational stage
  - c. concrete operational stage
  - d. formal operational stage
5. What distinguishes the concrete operational from the formal operational?
  - a. The adolescents' ability to differentiate b/w the real and possible
  - b. The adolescents' ability to represent something
  - c. The adolescents' ability to reverse his/her thinking
  - d. The adolescents' ability to conserve something
6. A teacher asks a class of fifth-graders to imagine how they would walk home if their usual route were blocked and they had to take another route. Students are asked to draw a map depicting how they would arrive home. This activity demonstrates students' ability to:
  - a. seriate
  - b. reverse their thinking
  - c. classify events
  - d. test hypothesis
7. Which of the following is the best example of scaffolding?
  - a. giving a detailed lecture
  - b. asking students to write a research paper
  - c. providing students with a variety of equipments to learn
  - d. reminding students of important steps during problem solving

Answers: 4. (a) 5. (a) 6. (b) 7. (d)

## 3.6 ORGANIZATION OF RELEVANT ACTIVITIES IN THE CLASSROOM AT THE FOLLOWING LEVELS

A variety of experiences affect the development of cognition among children. This section reviews some activities that can be used to support children's cognitive development.

### **3.6.1 Preschool and Kindergarten**

The preschool and kindergarten children have more flexible action patterns. Play, at this stage supports the cognitive development of children. Preschool and children up to the first or second grade at school can be engaged in different types of play to support their cognitive development. These include, for example, object play (e.g., building objects with blocks), pretend play (role plays e.g., teacher), social play (e.g., using different objects for different purposes), and locomotor play (e.g., playing tag in which children run after each other). Besides, hands-on activities (e.g., cutting out alphabets, conducting simple science experiments, counting with the paddle-pop sticks) are critical in developing advanced thinking and cognition. It is important to frequently use concrete props or visual aids with the preschool and kindergarten children to help them learn. Overall, children's learning experiences should include a variety of opportunities including both in-class and out of class activities to facilitate the process of cognitive change.

### **3.6.2 Elementary Level**

Children's cognitive development undergoes rapid changes during the early years of school. A number of activities and strategies may help the elementary school child to make cognitive progress at this stage. These include, for example, allowing children to experiment, encouraging discovery learning, reading with the children, encouraging them to share ideas and opinions, asking them to make comparisons, classify and categorize objects, things or events, engaging them in the drama and role playing, and asking them to justify their answers and actions. Moreover, since children have different intellectual demands, it is important to engage them in individual or small group activities according to their interests, for example, a portfolio or a group project.

## **3.7 SELF-ASSESSMENT QUESTIONS**

1. Are you intelligent by nature or is your intelligence influenced from nurture? Justify your opinion with reasons.
2. What are the limitations of using group intelligence tests?
3. How does children's logical thinking develop across the following stages of Piaget's theory: preoperational, concrete operational and formal operational stage?
4. What would you do to help the preoperational child with his egocentrism?
5. Have you ever taught someone (e.g., a younger sibling or a nephew/niece)? How did you provide social guidance and scaffolding to him/her? How is the scaffolding provided by you similar or different to the one explained by Vygotsky?

### **3.8 REFERENCES**

Berk, L. E. (2013). *Child development* (9th ed.). Upper Saddle River, U.S.A: Pearson Education Inc.

O'Donnell, A. M., Reeve, J., & Smith, J. K. (2012). *Educational psychology: Reflection for action* (3rd ed.). U.S.A: John Wiley & Sons, Inc.