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## **UNIT 2 MULTIPLE THEORIES OF INTELLIGENCE (GUILFORD, GARDNER AND STERNBERG)**

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## **2.0 INTRODUCTION**

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In Unit 1 we discussed a number of definitions of intelligence. We also noted that there is some sort of an agreement that reasoning, problem solving, thinking and other cognitive processes are all of relevance to intelligence. In other words it can be stated that intelligence comprises a variety of human cognitive activities such as learning from past experiences, adaptation to new situations, and thinking abstractly. In the first decade of the twentieth century, factor-analytic approach became popular and the debate about whether or not intelligence is a unitary construct still continues. Nowadays intelligence is conceived in terms of multiple abilities. In the present unit we will discuss three important theories of intelligence. First, we will explain the salient features of Guilford's Structure-of-Intellect

Theory, then we will turn our attention to highlight Howard Gardner's Theory of Multiple Intelligence, and finally we will discuss Sternberg's Triarchic Theory of intelligence.

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## 2.1 OBJECTIVES

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After reading this unit, you will be able to:

- Describe the contemporary approaches to intelligence;
- Elucidate Guilford's Structure-of-Intellect theory;
- Explain the multiple intelligences identified by Gardner;
- Differentiate between Guilford's structure-of-intellect theory and Gardner's theory of multiple intelligences;
- Define the triarchic theory of intelligence propounded by Sternberg; and
- Differentiate between Gardner's theory of multiple intelligences and Sternberg's triarchic theory of intelligence.

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## 2.2 GUILFORD'S STRUCTURE-OF-INTELLECT THEORY

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There are two distinct approaches to understand the nature of intelligence. The proponents of the first approach viewed intelligence as a single entity and developed their theories that take into account the biological reasons for intelligence. They view neural processing speed as the root of intelligence as such their theory has an effective causal explanation. The proponents of the second notion believed that intelligence is not a single or unitary ability, rather there are several intelligences. As for multiple intelligences, there are many theorists in that school of thought as well. Some of the theories presented by the proponents of multiple intelligences are excessive and have too many constructs to account for the explanation of intelligence. Guilford's Structure-of-Intellect (SOI) Model is such a multiple intelligences theory.

J. P. Guilford, was born on March 7, 1897 in Marquette, Nebraska. His interest in individual differences started from his childhood, when he observed the differences in ability among the members of his own family. As an undergraduate student at the University of Nebraska, he worked as an assistant in the psychology department. At Cornell University from 1919 to 1921, he studied under Edward Titchener and conducted intelligence testing on children. During his time at Cornell University, he also served as director of the university's psychological clinic. From 1927 to 1928, Guilford worked at the University of Kansas, after which he became Associate Professor at University of Nebraska, remaining there from 1928 to 1940. In 1940 he was appointed as psychology professor at the University of Southern California, where he stayed until 1967. Guilford retired from teaching in 1967, but continued to write and publish. He died on November 26, 1987.

Guilford believed that intelligence was not a monolithic, global attribute but a combination of multiple abilities, which were relatively independent. He applied factor analytic method to study these mental abilities. Building upon the views of Thurstone (1939), Guilford rejected Charles Spearman's view that intelligence

could be characterised by a single numerical parameter (“general intelligence factor” or *g*). He also rejected broad factor groups like that of Thurstone’s primary abilities. According to him, intelligence consists of numerous intellectual abilities. By the 1950’s, Guilford felt there needed to be a system developed to classify the new mental abilities being discovered.

In 1956, the first version of the Structure-of-Intellect (SOI) model was presented. The structure of intellect defines intelligence as a systematic collection of abilities or functions for processing different kinds of items of information in various ways. Originally the SOI model included four types of mental contents dimension (figural, symbolic, semantic, and behavioural), five types of operations dimension (cognition, memory, evaluation, convergent production and divergent production), and six types of products dimension (units, classes, relations, systems, transformations, and implications), thus resulting in 120 factors, with over 100 having been empirically verified. This model is represented as a cube with each of the three dimensions occupying one side. Many of the abilities are believed to be correlated with each other. The model also suggests where new abilities may be discovered based on existing abilities.

Subsequently, Guilford (1977) modified his model and divided *figural* factor of the content dimension into *visual* and *auditory* factors, thus making five types of the contents dimension, instead of the original four types. In the modified version the number of cells became 150 (5 contents  $\times$  5 Operations  $\times$  6 Products = 150 cells). The definition given by Guilford for each of these is too lengthy to present here; they will be described very briefly.

### 2.2.1 The Contents Dimension

This dimension includes the broad areas of information in which operations are applied. It has been divided into four categories.

- *Visual* - Information arising from stimulation on the retina in the form of an image.
- *Auditory* – Information arising from stimulation of the cochlea of the ear as image.
- *Symbolic* - Information perceived as symbols or signs that have no meaning by themselves; for example, Arabic numerals or the letters of an alphabet.
- *Semantic* - Information perceived in words or sentences, whether oral, written, or silently in one’s mind.
- *Behavioural* – Information perceived as acts of an individual/ individuals.

### 2.2.2 The Operations Dimension

This consists of five kinds of operation or general intellectual processes:

- *Cognition* - The ability to understand, comprehend, discover, and become aware.
- *Memory* - The ability to memorise information.
- *Divergent Production* - The process of generating multiple solutions to a problem
- *Convergent Production* - The process of deducing a single solution to a problem.
- *Evaluation* - The process of judging whether an answer is accurate, consistent, or valid.

### 2.2.3 The Products Dimension

As the name suggests, this dimension contains results of applying particular operations to specific contents. There are six kinds of products, they are:

- *Unit* - Represents a single item of information.
- *Class* - A set of items that share some attributes.
- *Relation* - Represents a connection between items or variables; may be linked as opposites or in associations, sequences, or analogies.
- *System* - An organisation of items or networks with interacting parts.
- *Transformation* - Changes perspectives, conversions, or mutations to knowledge; such as reversing the order of letters in a word.
- *Implication* - Predictions, inferences, consequences, or anticipations of knowledge.

Some examples may provide a feel for the kinds of distinctions made in this model. Suppose a subject is given a long list of unrelated words to study and is asked to recall them later. The *content* of this scale is “semantic,” since it involves words; the *operation* is “memory”; and the *product* is the recall of words as “units.”

### 2.2.4 Evaluation

Guilford’s Structure-of-Intellect theory is more complex than Thurstone’s, which grew out of a massive analysis of a great many existing tests. Research from different fields, such as developmental psychology, artificial intelligence, and neurology, shows that the mind consists of several independent (albeit interdependent) modules or “intelligences.” According to Eysenck (1972), Guilford “concentrated most of his studies on populations with a restricted range of intelligence, thus reducing the scope of “g”; and he has used orthogonal methods of rotation, thus ignoring the correlations between “simple structure” factors which would have emerged if he had used an oblique method of rotation...Of more practical importance is the criticism that Guilford’s factors are so narrow and specialised that they have little value in prediction, as in educational and vocational guidance” (p. 3). In spite of these criticisms it is important to note that Guilford left a significant mark on research into intelligence. Many tests that are still used in modern intelligence testing were modified and developed under his guidance.

#### Self Assessment Questions

1) What do you understand by the term multiple intelligences?

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- 2) Elucidate Structure of Intellect Theory.

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- 3) What are the three dimensions of Guilford's theory of MI?

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- 4) Critically evaluate the construct-of-intellect theory of Guilford.

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## 2.3 GARDNER'S THEORY OF MULTIPLE INTELLIGENCES

Howard Gardner was born in Scranton, Pennsylvania in 1943. In order to make a career in law, he joined Harvard University. However, he was lucky enough to have Eric Erikson as a tutor. In Howard Gardner's words Erikson probably 'sealed' his ambition to be a scholar (1989). He entered Harvard's doctoral programme in 1966, and in the following year became part of the Project Zero research team on arts. Howard Gardner completed his PhD in 1971 (his dissertation was on style sensitivity in children). He remained at Harvard. Alongside his work with Project Zero, he was a lecturer (1971-1986) and then professor in education (1986- ). His first major book, *The Shattered Mind* appeared in 1975 and some fifteen have followed.

Project Zero provided an environment in which Howard Gardner could begin to explore his interest in human cognition. He proceeded in a very different direction to the dominant discourses associated with Piaget and with psychometric testing. Project Zero developed as a major research centre for education and provided an intellectual home for a significant grouping of researchers. A key moment came with the establishment of the Project on Human Potential in the late 1970s (funded by Bernard van Leer Foundation) to 'assess the state of scientific knowledge concerning human potential and its realisation'.

In 1981 Gardner was awarded a MacArthur Prize Fellowship in support of Project Zero at Harvard University. An announcement of the award quoted Gardner as saying early in his career, that he had been a committed Piagetian, but as he pursued his own studies he came to view Piaget's theories as "too narrow a notion of how the human mind works." He noted further that he did not believe there was "one form of cognition which cuts across all human thinking. There are multiple intelligences with autonomous intelligence capacities." This statement heralded the writing of his book *Frames of Mind*, which was published in 1983.

Gardner (1983) claimed that most previous conceptualisations of intelligence had been too narrowly based. He argued that evidence from several different sources (e.g. cross-cultural accounts of cognition, studies of exceptional groups, psychometric data, and psychological training studies) pointed to the existence of several intelligences.

According to Gardner (1999), intelligence is much more than IQ because a high IQ in the absence of productivity does not equate to intelligence. In terms of his definition (1983): "Intelligence is a bio-psychological potential to process information that can be activated in a cultural setting to solve problems or create products that are of value in a culture". Consequently, instead of intelligence being a single entity described psychometrically with an IQ score, Gardner's definition views it as many things. He endeavored to define intelligence in a much broader way than did the psychometricians. To achieve this goal Gardner (1983; 1999) established several criteria for defining intelligence. In identifying capabilities to be considered for one of the "multiple intelligences" the construct under consideration had to meet eight criteria rather than resting on the results of a narrow psychometric approach.

To qualify as "intelligence" the particular capacity under study was considered from multiple perspectives consisting of eight specific criteria drawn from the biological sciences, logical analysis, developmental psychology, experimental psychology, and psychometrics. The criteria to consider "candidate intelligences" (Gardner, 1999) are:

- the potential for brain isolation by brain damage,
- its place in evolutionary history,
- the presence of core operations,
- susceptibility to encoding,
- a distinct developmental progression,
- the existence of idiot-savants, prodigies and other exceptional people,
- support from experimental psychology, and
- support from psychometric findings.

From the above eight criteria, Gardner initially formulated a list of seven intelligences. In 1999, he added naturalist intelligence as the eighth. He has also considered inclusion of existential intelligence as the ninth intelligence in his theory (Slavin, 2009). The first two have been typically valued in schools; the next three are usually associated with the arts; the next two are what Gardner called 'personal intelligences'; while the newly added final two are related to aesthetics and philosophical views of life (Gardner 1999). Each of these intelligences will now be briefly described.

### 2.3.1 Linguistic Intelligence

This intelligence includes the ability to effectively use language to express oneself rhetorically or poetically; and as a means to remember information. Writers, poets, lawyers and speakers are among those that Howard Gardner sees as having high linguistic intelligence. This area has to do with words, spoken or written. People with high verbal-linguistic intelligence display a facility with words and languages. They are typically good at reading, writing, telling stories and memorizing words along with dates. They tend to learn best by reading, taking notes, listening to lectures, and discussion and debate. Those with verbal-linguistic intelligence learn foreign languages very easily as they have high verbal memory and recall, and an ability to understand and manipulate syntax and structure. Careers that suit those with this intelligence include writers, lawyers, policemen, philosophers, journalists, politicians, poets, and teachers.

### 2.3.2 Logical-mathematical Intelligence

This intelligence consists of the capacity to analyse problems logically, carry out mathematical operations, and investigate issues scientifically. In Howard Gardner's words, it entails the ability to detect patterns, reason deductively and think logically. This intelligence is most often associated with scientific and mathematical thinking. This area has to do with logic, abstractions, reasoning, and numbers. While it is often assumed that those with this intelligence naturally excel in mathematics, chess, computer programming and other logical or numerical activities, a more accurate definition places less emphasis on traditional mathematical ability and more on reasoning capabilities, abstract patterns of recognition, scientific thinking and investigation, and the ability to perform complex calculations. It correlates strongly with traditional concepts of "intelligence" or IQ. Careers which suit those with this intelligence include scientists, physicists, mathematicians, logicians, engineers, doctors, economists and philosophers.

### 2.3.3 Musical Intelligence

This intelligence involves skill in the performance, composition, and appreciation of musical patterns. It encompasses the capacity to recognise and compose musical pitches, tones, and rhythms. According to Howard Gardner musical intelligence runs in an almost structural parallel to linguistic intelligence. This area has to do with sensitivity to sounds, rhythms, tones and music. People with a high musical intelligence normally have good pitch and may even have absolute pitch and are able to sing, play musical instruments, and compose music. Since there is a strong auditory component to this intelligence, those who are strongest in it may learn best via lecture. Language skills are typically highly developed in those whose base intelligence is musical. In addition, they will sometimes use songs or rhythms to learn. They have sensitivity to rhythm, pitch, meter, tone, melody or timbre. Careers that suit those with this intelligence include instrumentalists, singers, conductors, disc-jockeys, orators, writers and composers.

### 2.3.4 Bodily-kinesthetic Intelligence

It entails the potential of using one's whole body or parts of the body to solve problems. It is the ability to use mental abilities to coordinate bodily movements. In theory, people who have bodily-kinesthetic intelligence should learn better by involving muscular movement (e.g. getting up and moving around into the

learning experience), and are generally good at physical activities such as sports or dance. They may enjoy acting or performing, and in general they are good at building and making things. They often learn best by doing something physically, rather than by reading or hearing about it. Careers that suit those with this intelligence include: athletes, dancers, musicians, actors, surgeons, doctors, builders, police officers, and soldiers. Although these careers can be duplicated through virtual simulation, they will not produce the actual physical learning that is needed in this intelligence.

### **2.3.5 Spatial Intelligence**

Spatial intelligence involves the potential for recognising and manipulating the patterns of both wide spaces such as those negotiated by pilots or navigators, and confined spaces such as those encountered by sculptors, architects or championship chess players. This area deals with spatial judgment and the ability to visualise with the mind's eye. Careers which suit those with this type of intelligence include artists, designers and architects. A spatial person is also good with puzzles.

### **2.3.6 Interpersonal Intelligence**

This intelligence is concerned with the capacity to understand the intentions, motivations and desires of other people. It allows people to work effectively with others. Educators, sales people, religious and political leaders and counselors all need a well-developed interpersonal intelligence. This area has to do with interaction with others. In theory, people who have a high interpersonal intelligence tend to be extrovert, characterised by their sensitivity to others' moods, feelings, temperaments and motivations, and their ability to cooperate in order to work as part of a group. They communicate effectively and empathise easily with others, and may be either leaders or followers. They typically learn best by working with others and often enjoy discussion and debate. Careers that suit those with this intelligence include sales, politicians, managers, teachers, and social workers.

### **2.3.7 Intrapersonal Intelligence**

This entails the capacity to understand oneself, to appreciate one's feelings, fears and motivations. In Howard Gardner's view it involves having an effective working model of ourselves, and to be able to use such information to regulate our lives. This area has to do with introspective and self-reflective capacities. People with intrapersonal intelligence are intuitive and typically introverted. They are skillful at deciphering their own feelings and motivations. This refers to having a deep understanding of the self; what are your strengths/ weaknesses, what makes you unique, you can predict your own reactions/ emotions. Careers which suit those with this intelligence include philosophers, psychologists, theologians, lawyers, and writers. People with intrapersonal intelligence also prefer to work alone.

### **2.3.8 Naturalistic Intelligence**

This intelligence has to do with nature, nurturing and relating information to one's natural surroundings. Such a person demonstrates expertise in recognition and classification of the numerous species - the flora and fauna – of her or his environment. Careers which suit those with this intelligence include naturalists, farmers and gardeners.

### 2.3.9 Existential Intelligence

This is an ability to contemplate phenomena or questions beyond sensory data, such as the infinite and infinitesimal. Careers which suit those with this intelligence include cosmologists, and philosophers.

According to Gardner (1983), each of these “intelligences” has a specific set of abilities that can be observed and measured. The first two forms of intelligence are typically the abilities that contribute to strong performance in traditional school environments and to producing high scores on most IQ measures or tests of achievement. The next three forms are very crucial for artists. The next two, viz., interpersonal and intrapersonal intelligences, are personal intelligences. Interpersonal intelligence indicates a person’s ability to recognise the intentions, feelings and motivations of others. People who possess and develop this quality are likely to work well with others and may choose fields like sales, teaching, counselling or politics in order to use them when required. Intrapersonal intelligence is described as the ability to understand oneself and use that information to regulate one’s own life. The last two intelligences are related to aesthetic feelings and philosophical issues. Gardner (1998) nominated three additional candidate intelligences: Naturalist, Spiritual and Existential intelligence and evaluated them in the context of the eight criteria he had established in his research and outlined earlier in this unit.

In *Frames of Mind*, Howard Gardner (1983) treated the personal intelligences ‘as a piece’. Because of their close association in most cultures, they are often linked together. However, he still argues that it makes sense to think of two forms of personal intelligence. Gardner claimed that the seven intelligences rarely operate independently. They are used at the same time and tend to complement each other as people develop skills or solve problems.

According to Gardner, our schools as well as the society focus most of its attention on linguistic and logical-mathematical intelligence. Gardner emphasises that we should also place equal attention on individuals who show gifts in the other intelligences: the artists, architects, musicians, naturalists, designers, dancers, therapists, entrepreneurs, and others who enrich the world in which we live. Unfortunately, many children who have these gifts don’t receive much reinforcement for them in their schools. Many of these kids, in fact, end up being labeled “learning disabled,” “attention deficit disorder” (ADD), or simply underachievers, when their unique ways of thinking and learning aren’t addressed by a heavily linguistic or logical-mathematical classroom.

The theory of multiple intelligences proposes a major transformation in the way our schools are run. It suggests that teachers need to be trained to present their lessons in a wide variety of ways using music, cooperative learning, art activities, role play, multimedia, field trips, inner reflection, and much more. The theory of multiple intelligences also has strong implications for adult learning and development. Many adults find themselves in jobs that do not make optimal use of their most highly developed intelligences (for example, the highly bodily-kinesthetic individual who is stuck in a linguistic or logical desk-job when he or she would be much happier in a job where they could move around, such as a recreational leader, a forest ranger, or physical therapist).

The theory of multiple intelligences gives adults a whole new way to look at their lives, examining potentials that they left behind in their childhood (such as

a love for art or drama) but now have the opportunity to develop through courses, hobbies, or other programmes of self-development.

### 2.3.10 Evaluation

Howard Gardner's work around multiple intelligences has had a profound impact on thinking and practice in education. His theory has wide implications in the field of teaching and learning. For example, if you're teaching or learning about the law of supply and demand in economics, you might read about it (linguistic), study mathematical formulas that express it (logical-mathematical), examine a graphic chart that illustrates the principle (spatial) and then utilise all information into your teaching programme. One of the interesting characteristics of Gardner's theoretical approach is that several of the intelligences are not specifically cognitive in nature.

The concept of multiple intelligences can be quite useful in investigating specialised functions or clinical cases of mental dysfunctions. The major objection to the concept, however, is that an excessive importance is placed on the independence of these intelligences from one another and divides human beings on the basis of a new typology. In fact, the brain and indeed the human being act as a whole, and no one mental activity can be truly independent of another.

Gardner's theory has also been criticized by many psychologists on several grounds. The fundamental criticism of this theory is the belief by scholars that each of the seven multiple intelligences is in fact a cognitive style rather than a stand-alone construct (Morgan, 1996). Hunt (2001) criticised Gardner's theory on the ground that "theory of multiple intelligences cannot even be evaluated by the canons of science until it is made specific enough to generate measurement models" (p. 7). M. W. Eysenck (1990) remarked that "there are grounds for doubting that he has identified different intelligences rather than different abilities" (p. 193). As Sternberg and Frensch (1990) pointed out, it seems strange to describe someone who is tone deaf or physically uncoordinated as unintelligent. Other criticisms include the notion that the theory of multiple intelligences is not empirical, is incompatible with "g", heritability, and environmental influences, and broadens the construct of intelligence so widely as to render it meaningless.

However, we can conclude following the contentions of Das (1999), that "it can certainly be stated that the different types of intelligence included in Gardner's system of multiple intelligences is consistent with investigations of distinct talents and skills in individuals. We do study the nature of musical ability, strategies involved in playing chess, the thought processes of logicians and mathematicians, and early indicators of being a cricket player, or a smooth, persuasive sales person" (p.222).

#### Self Assessment Questions

- 1) Describe Project Zero.

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- 2) What are the multiple intelligences identified by Gardner?

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- 3) Evaluate the importance of Gardner's approach in the explanation of intelligence.

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- 4) How does Gardner's theory differ from Guilford's construction of intellect theory?

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- 5) What is existential intelligence? Describe

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## 2.4 STERNBERG'S TRIARCHIC THEORY OF INTELLIGENCE

Robert Jeffrey Sternberg (born December 8, 1949), is an American psychologist and psychometrician. He received his B.A. degree from the Yale University and Ph.D. from the Stanford University under the supervision of Gordon Bower. He was Provost at Oklahoma State University. He was formerly the Dean of Arts and Sciences at Tufts University, IBM Professor of Psychology and Education at Yale University and the President of American Psychological Association. He holds ten honorary doctorates from one North American, one South American, and eight European universities, and additionally holds an honorary professorate at the University of Heidelberg in Germany. He is also a Distinguished Associate of The Psychometrics Centre at the University of Cambridge.

The triarchic theory of intelligence developed by Sternberg is “a comprehensive theory, because it takes into account social and contextual factors apart from human abilities” (Li, 1996). Sternberg (1985) felt that the theories that preceded him were not incorrect, but rather, incomplete. Consequently, his theory, like Gardner’s, takes into account creative or musical intelligence. But as for the other six intelligences from Gardner’s theory, Sternberg classified them into two different types of intelligences: analytic (or academic) and practical. These two types of intelligence differ and are defined as follows: Analytic problems tend to have been formulated by other people, be clearly defined, come with all information needed to solve them, have only a single right answer, which can be reached by only a single method, be disembodied from ordinary experience, and have little or no intrinsic interest. Practical problems tend to require problem recognition and formulation, be poorly defined, require information seeking, have various acceptable solutions, be embedded in and require prior everyday experience, and require motivation and personal involvement. (Neisser, *et al.*, 1996). If an individual could solve one or the other of these types of problems well, then that individual would have a high analytic or practical intelligence, respectively. Also, there exists virtuosos, or individuals who are extremely talented in the fine arts, these people would have a high creative intelligence.

Sternberg’s triarchic theory includes three facets or subtheories: (i) the componential subtheory which outlines the structures and mechanisms that underlie intelligent behaviour categorised as metacognitive, performance, or knowledge acquisition components, (ii) the experiential subtheory that proposes intelligent behaviour be interpreted along a continuum of experience from novel to highly familiar tasks/situations, (iii) the contextual subtheory which specifies that intelligent behaviour be defined by the socio-cultural context in which it takes place and involves adaptation to the environment, selection of better environments, and shaping of the present environment. According to Sternberg, a complete explanation of intelligence entails the interaction of these three subtheories. The componential subtheory specifies the potential set of mental processes that underlies behaviour (i.e., how the behaviour is generated) while the contextual subtheory relates intelligence to the external world in terms of what behaviours are intelligent and where. The experiential subtheory addresses the relationship between the behaviour in a given task/situation and the amount of experience of the individual in that task/situation.

### Triarchic Theory

Componential Subtheory	Experiential Subtheory	Contextual Subtheory
Metacomponents	Novelty	Adaptation
Performance	Automation	Selection
Acquisition		Shaping
Acquisition		Shaping

#### 2.4.1 Componential or Analytical Facet or Subtheory

Componential or analytical intelligence is the ability to complete academic, problem-solving tasks. These types of tasks usually present well-defined problems that have only a single correct answer. It is similar to the standard psychometric definition of intelligence e.g. as measured by academic problem solving, analogies

and puzzles, and corresponds to his earlier componential intelligence. Sternberg considers that this reflects how an individual relates to his internal world. According to Sternberg, analytical intelligence (academic problem-solving skills) is based on the joint operations of metacomponents and performance components and knowledge acquisition components of intelligence.

*Metacomponents* control, monitor and evaluate cognitive processing. These are the *executive* functions to order and organise performance and knowledge acquisition components. They are the higher-order processes that order and organise the performance components. They are used to analyse problems and pick a strategy for solving them. They decide what to do and the performance components actually do it.

*Performance Components* execute strategies assembled by the metacomponents. They are the basic operations involved in any cognitive act. They are the cognitive processes that enable us to encode stimuli, hold information in short-term memory, make calculations, perform mental calculations, mentally compare different stimuli, and retrieve information from long-term memory.

*Knowledge acquisition components* are the processes used in gaining and storing new knowledge – i.e. capacity for learning. The strategies you use to help memorize things exemplify the processes that fall into this category.

#### 2.4.2 Experiential or Creative Facet or Subtheory

Experiential or creative intelligence is the ability to successfully deal with new and unusual situations by drawing on existing knowledge and skill. Individuals high in creative intelligence may give ‘wrong’ answers because they see things from a different perspective. Thus creative intelligence involves insights, synthesis and the ability to react to novel situations and stimuli. Sternberg considers it as experiential aspect of intelligence because it reflects how an individual connects the internal world to external reality. Sternberg considers the creative facet to comprise the ability that allows people to think creatively and that which allows people to adjust creatively and effectively to new situations. Sternberg believes that more intelligent individuals will also move from consciously learning in a novel situation to automating the new learning so that they can attend to other tasks. Thus experiential facet deals mainly with how well a task is performed with regard to how familiar it is.

Sternberg splits the role of experience into two parts: novelty and automation. A *novel* situation is one that you have never experienced before. People who are adept at managing a novel situation can take the task and find new ways of solving it that the majority of people would not notice (Sternberg, 1997). A process that has been *automated* has been performed multiple times and can now be done with little or no extra thought. Once a process is automated, it can be run in parallel with the same or other processes. The problem with novelty and automation is that being skilled in one component does not ensure that you are skilled in the other also (Sternberg, 1997).

#### 2.4.3 Contextual or Practical Facet or Subtheory

Sternberg’s third subtheory of intelligence, called practical or contextual, “deals with the mental activity involved in attaining fit to context” (Sternberg, 1985). It is the ability to adapt to everyday life by drawing on existing knowledge and

skills. Practical intelligence enables an individual to understand what needs to be done in a specific setting and then do it. Through the three processes of adaptation, shaping, and selection, individuals create an ideal fit between themselves and their environment. This type of intelligence is often referred to as “street smarts.”

*Adaptation* occurs when one makes a change within oneself in order to better adjust to one’s surroundings (Sternberg, 1985). For example, when the weather changes and temperatures drop, people adapt by wearing extra layers of clothing to remain warm. *Shaping* occurs when one changes their environment to better suit one’s needs (Sternberg, 1985). A teacher may invoke the new rule of raising hands to speak to ensure that the lesson is taught with least possible disruption. The process of *selection* is undertaken when a completely new alternate environment is found to replace the previous, unsatisfying environment to meet the individual’s goals (Sternberg, 1985). For instance, immigrants leave their lives in their homeland countries where they endure economical and social hardships and go to other countries in search of a better and less strained life.

Sternberg’s *triarchic theory of intelligence* contends that intelligent behaviour arises from a balance between analytical, creative and practical abilities, and that these abilities function collectively to allow individuals to achieve success within particular socio-cultural contexts (Sternberg, 1988; 1997; 1999). Analytical abilities enable the individual to evaluate, analyse, compare and contrast information. Creative abilities generate invention, discovery, and other creative endeavors. Practical abilities tie everything together by allowing individuals to apply what they have learned in the appropriate setting. To be successful in life the individual must make the best use of his or her analytical, creative and practical strengths, while at the same time compensating for weaknesses in any of these areas. This might involve working on improving weak areas to become better adapted to the needs of a particular environment, or choosing to work in an environment that values the individual’s particular strengths. For example, a person with highly developed analytical and practical abilities, but with less well-developed creative abilities, might choose to work in a field that values technical expertise but does not require a great deal of imaginative thinking. Conversely, if the chosen career does value creative abilities, the individual can use his or her analytical strengths to come up with strategies for improving this weakness. Thus, a central feature of the triarchic theory of successful intelligence is adaptability-both within the individual and within the individual’s socio-cultural context (Cianciolo & Sternberg, 2004).

#### 2.4.4 Evaluation

The triarchic theory of intelligence provides a useful way of understanding human intelligence. It seems to capture important aspects of intelligence not captured by more conventional theories. It also differs from the theories of Howard Gardner, which emphasise nine independent multiple intelligences (such as linguistic and musical intelligence), and from the theory of emotional intelligence. The triarchic theory emphasises processes of intelligence, rather than domains of intelligence, as in Gardner’s theory. It also views emotions as distinct from intelligence. Eventually, a theory may be proposed that integrates the best elements of all existing theories.

Triarchic theory has also been criticized by the psychologists. Gottfredson, (2003) criticized the unempirical nature of triarchic theory and argued that it is absurd to assert that traditional intelligence tests are not measuring practical intelligence when they show a moderate correlation with income, especially at middle age when individuals have had a chance to reach their maximum career potential. It is also claimed that what Sternberg calls practical intelligence is not a broad aspect of cognition at all but simply a specific set of skills people learn to cope with a specific environment (task specific knowledge). According to Das (2004), the major difficulty in Sternberg's theory is "in translating them to psychometric instruments for the measurement of cognitive abilities" (p. 12). As for the creative component of Sternberg's model, a study questions whether it's meaningful to treat creativity as a cognitive ability separate from analytical intelligence, but instead finds that creativity is simply the product of a high intelligence score.

### Self Assessment Questions

- 1) Discuss Sternberg's triarchic theory of intelligence.

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- 2) Explain the three subtheories or facets of the triarchic theory of intelligence.

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- 3) How is triarchic theory of intelligence different from the construct-of-intellect theory?

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## 2.5 LET US SUM UP

According to Guilford intelligence is not one monolithic, global attribute but a combination of multiple abilities. He believed that there were many relatively independent mental ability factors. Guilford applied his factor analytic methodology to study these mental abilities. In 1956, the first version of the

Structure-of-Intellect (SOI) model was presented, which was subsequently revised by him in 1977. The SOI model includes a Content dimension, Products dimension, and Operations dimension. It is represented as a cube with each of the three dimensions occupying one side. Each ability is defined by a conjunction of the three categories, occupying one cell in the three-dimensional figure. There are five categories of content including visual, auditory, symbolic, semantic, and behavioural. Six categories exist in the products dimension including units, classes, relations, systems, transformation, and implications. The five kinds of operations include cognition, memory recording, memory retention, divergent production, convergent production, and evaluation. Guilford's SOI Theory is an open system such that it allows for newly discovered categories to be added in any of three directions. Many of the abilities are believed to be correlated with each other. The  $5 \times 6 \times 5$  model of Guilford provides 150 possible abilities, with over 100 having been empirically verified. The model also suggests where new abilities may be discovered based on existing abilities.

The theory of multiple intelligences was developed in 1983 by Dr. Howard Gardner. It suggests that the traditional notion of intelligence, based on I.Q. testing, is far too limited. Instead, Gardner proposed nine different intelligences to account for a broader range of human potential in children and adults. Gardner's Theory of Multiple Intelligences proposes that people use seven (or nine) relatively autonomous intellectual capacities to approach problems and create products. These include linguistic, musical, logical-mathematical, spatial, bodily-kinesthetic, interpersonal, intrapersonal, naturalistic and existential intelligences. He suggests that "although they are not necessarily dependent on each other, these intelligences seldom operate in isolation. Every normal individual possesses varying degrees of each of these intelligences, but the ways in which intelligences combine and blend are as varied as the faces and the personalities of individuals."

Sternberg's triarchic theory of intelligence consists of three subtheories: (i) the componential subtheory, which outlines the structures and mechanisms that underlie intelligent behaviour categorised as metacognitive, performance, or knowledge acquisition components, (ii) the experiential subtheory that proposes intelligent behaviour be interpreted along a continuum of experience from novel to highly familiar tasks/situations, and (iii) the contextual subtheory, which specifies that intelligent behaviour be defined by the socio-cultural context in which it takes place and involves adaptation to the environment, selection of better environments, and shaping of the present environment. According to Sternberg, a complete explanation of intelligence entails the interaction of these three subtheories. The componential subtheory specifies the potential set of mental processes that underlie behaviour (i.e., how the behaviour is generated), while the contextual subtheory relates intelligence to the external world in terms of what behaviours are intelligent and where. The experiential subtheory addresses the relationship between the behaviour in a given task/situation and the amount of experience of the individual in that task/situation.

## **2.6 UNIT END QUESTIONS**

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- 1) How does theory of multiple intelligences differ from unitary theory of intelligence?
- 2) Highlight the important features of construct-of-intellect theory of Guilford.

- 3) Are the nine kinds of intelligence proposed by Gardner interrelated?
  - 4) Evaluate the importance of Gardner's approach in the explanation of intelligence.
  - 5) How is Gardner's theory different from Guilford's construct-of-intellect theory?
  - 6) Critically evaluate Sternberg's triarchic theory of intelligence.
  - 7) Explain the three subtheories or facets of triarchic theory of intelligence
  - 8) How is triarchic theory of intelligence different from the construct-of-intellect theory?
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Multiple Theories of Intelligence (Guilford, Gardner and Sternberg)

## 2.7 GLOSSARY

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<b>Artificial intelligence</b>	: A branch of science that studies the capacity of computers to demonstrate performing that if, it were produced by human beings, would be described as showing the intelligence.
<b>Contents dimension</b>	: In Guilford's three dimensional theory of intelligence construction of intellect includes five broad areas of information to which the human intellect applies the six operations.
<b>Factor analysis</b>	: Mathematical procedure, involving correlations, for sorting trait terms or test responses into clusters or factors. It identifies items that are homogeneous or internally consistent.
<b>Intelligence test</b>	: A standardised psychological test of general mental ability.
<b>Intelligence quotient (IQ) :</b>	An index of individual's development determined by dividing his mental age by his chronological age and multiplying the result by 100.
<b>Operations dimension</b>	: In Guilford's three dimensional theory of intelligence construction of intellect includes six operations or general intellectual processes.
<b>Products dimension</b>	: In Guilford's three dimensional theory of intelligence construction of intellect product dimension contains results of applying particular operations to specific contents. The SI model includes six products, in increasing complexity:

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