#### Introduction to Thinking:

Cognitive abilities like thinking, reasoning and problem-solving may be considered to be some of the chief characteristics which distinguish human beings from other species including the higher animals.

The information that our mental faculties receive or generate is in the form of mental representations. These mental representations may be in various forms e.g. in terms of words, visual images, or may be  sounds.

Thinking is the process whereby these mental representations are manipulated. The process of thinking transforms these representations into a new and different form. The transformation may be made:

·  For finding answers to questions

·  For finding solutions to problems

·  For finding facts and exploring reality

Definition of thinking

“Thinking is a mental activity in its cognitive aspect or mental activity with regard to psychological aspects”(Ross). “Thinking is a behaviour which is often implicit and hidden and in which symbols are ordinarily employed” (**Garrett)**. “Thinking is a problem-solving process in which we use ideas or symbols in place of overt activity” (**Gilmer)**. “Thinking is an implicit problem-solving behaviour” (**Mohsin)**.

**Thought** refers to ideas or arrangements of ideas that are the result of the process of thinking. Thinking allows humans to make sense of, interpret, represent the world they experience, and to make predictions about that world. It is therefore helpful to an organism with needs, objectives, and desires as it makes plans or otherwise attempts to accomplish those goals.

**The process of thought**: Thought is what happens in the mind. What happens in the mind

Step 1. We have a perception, an **O**bservation.

Step 2. **O**rientation. The Mind automatically reacts to the perception with a mix of the various elements of thought. We ‘make sense’ out of the perception based on the elements of thought that arise in response to the perception.

Step 3. **D**ecide. We make decisions, choices (based on the flow of our personal Matrix).

Step 4. Our choices translate into **A**ctions, which have results, which create our lives and the process flows on and on, from moment to moment.

**Types of Thinking:**

Thinking can be classified as follows:

**1. Perceptual or Concrete Thinking:**

This is the simplest form of thinking the basis of this type is perception, i.e. interpretation of sensation according to one’s experience. It is also called concrete thinking as it is carried out on the perception of actual or concrete objects and events.

**2. Conceptual or Abstract Thinking:**

Here one makes use of concepts, the generalized objects and languages, it is regarded as being superior to perceptual thinking as it economizes efforts in understanding and problem-solving.

**3. Reflective Thinking:**

This type of thinking aims in solving complex problems, thus it requires reorganization of all the relevant experiences to a situation or removing obstacles instead of relating with that experiences or ideas.

This is an insightful cognitive approach in reflective thinking as the mental activity here does not involve the mechanical trial and error type of efforts.

In this type, thinking processes take all the relevant facts arranged in a logical order into an account in order to arrive at a solution of the problem.

**4. Critical Thinking:**

It is a type of thinking that helps a person in stepping aside from his own personal beliefs, prejudices and opinions to sort out the faiths and discover the truth, even at the expense of his basic belief system.

Here one resorts to set higher cognitive abilities and skills for the proper interpretation, analysis, evaluation and inference, as well as explanation of the gathered or communicated information resulting in a purposeful unbiased and self-regulatory judgement.

An ideal thinker is habitually inquisitive, well-informed, open-minded, flexible, fair-minded in evaluation, free from personal bias and prejudices, honest in seeking relevant information, skilled in the proper use of the abilities like interpretation, analysis, synthesis, evaluation and drawing conclusion and inferences, etc.

The critical thinking is of a higher order well-disciplined thought process which involves the use of cognitive skills like conceptualization, interpretation, analysis, synthesis and evaluation for arriving at an unbiased, valid and reliable judgment of the gathered or communicated information or data as a guide to one’s belief and action.

**5. Non-directed or Associative Thinking:**

There are times when we find ourselves engaged in a unique type of thinking which is non-directed and without goal. It is reflected through dreaming and other free-flowing uncontrolled activities. Psychologically these forms of thought are termed as associative thinking.

Here day-dreaming, fantasy and delusions all fall in the category of withdrawal behaviour that helps an individual to escape from the demands of the real world by making his thinking face non-directed and floating, placing him somewhere, ordering something unconnected with his environment.

We hear there is nothing seriously abnormal in behaviour involving day­dreaming and fantasy but behaviour involving delusions definitely points towards abnormality.

A person under the influence of such delusions may think or believe that he is a millionaire, the ruler of the universe, a great inventor, a noted historian or even God. In contrast, a person in the grip of delusion may be inclined to be the most incapable, unworthy and unwanted person and may develop guilt feelings or complain that he is the victim of some incurable physical or mental diseases.

**6. Creative Thinking:**

This type of thinking is associated with one’s ability to create or construct something new, novel or unusual. It looks for new relationships and associations to describe and interpret the nature of things, events and situations. Here the individual himself usually formulates the evidences and tools for its solution. For example; scientists, artists or inventors.

Skinner, the famous psychologist says creative thinking means that the prediction and inferences for the individual are new, original, ingenious and unusual. The creative thinker is one who expresses new ideas and makes new observations, new predictions and new inferences.

**Characteristics of Creative Thinking:**

a. Creative thinking, in all its shapes and forms is absolutely an internal mental process and hence should be considered as an important component of one’s cognitive behaviour.

b. Every one of us is capable of creative thinking and hence it is a universal phenomenon.

c. Creative thinking results in the production of something new or novel including a new form of arrangement of old elements.

d. Creative thinking in all its dimensions involve divergent thinking instead of the routine and final types of convergent thinking. The mind must have complete freedom to wander around to create a new idea.

e. The field of creative thinking and its out part is quite comprehensive and built wide. It covers all the aspects of human accomplishments belonging to an individual’s life.

#### Basic elements of Thinking:

**1. Images:**

Mental images are an integral part of the thinking process; in fact a major part of our

thinking consists of these images. These mental representations are of the objects and events that we are, or we have been, in contact with. These images are not necessarily visual in nature but can be related to  all sorts of sensory experiences. In thinking, we usually manipulate the images rather than the actual objects, experiences or activities. Psychologists have developed exercises for enhancing people's ability in order

to sharpening their capacity to work on their mental images in thinking capacity and thinking skills, e.g. problem solving skills, brain teasing, creative thinking exercises.

**2. Concepts:**

A concept is a general idea that stands for a general class and represents the common characteristics of all objects or events of this general class. Concept, as a tool, economize the efforts in thinking, for example, when we hear the word ‘elephant’ we are at once reminded not only about the nature and qualities of elephant as a class but also our own experiences and understanding of them come to the surface in our consciousness to stimulate our thinking at that time.

There are three main types of concepts;

a) Artificial concepts

b) Natural concepts

c) Prototype concepts

**a) Artificial Concepts**: ·Concepts that have a unique set of traits and features, are easy to define and elaborate, e.g., a rectangle has two opposite sides equal, if it is not the case, then it is not a rectangle. But our everyday concept is much more difficult than these concepts.

b**) Natural Concepts**:  Known, familiar and relatively simple concepts that have rather loose  loose features to define and explain them. Some concepts are simple in the sense that they are clearly defined, e.g the concept of a square. But some concepts rather difficult to define, may be ambiguous, overlapping overlapping, and even abstract e.g. a flying bird.

**c) Prototypes**: Prototypes are used to define and explain objects and ideas that cannot be defined in a clear-cut and straightforward manner, e.g., the prototype of a table can be ‘dining table’ or the prototype of a bird can be a `crow'.

Agreement on prototypes: Usually people in a society or those   belonging to a particular  discipline, are unanimous about the prototypes of a concept e.g. if we have to give a prototype

of a vehicle, then we will talk about a ‘car’ and not an ‘escalator’ or ‘elevator’, although these also move and take us from one place to another. · On the other hand, if we are talking about varieties of `stairs', then we can probably take escalators as an example.

**Reasoning**: It is the ability to use reason, logic, past experience, and learnt information for

mental processing - for decision-making, and problem solving etc.

Deductive Reasoning; is the process whereby logical conclusions, inferences, and implications

 are drawn by using a set of assumptions. These inferences are then generalized over,

or applied to, specific cases. The assumptions or premises that are used for drawing conclusions

are thought to be true and base upon reality. In many cases they are considered to be unchallengeable. But at times these premises may turn out to be false when tested in reality e.g. all men are brave, or men do not cry.

**3. Symbols and signs:**

Symbols and signs represent and stand for substitute of the actual objects, experiences and activities. For example, traffic lights, railway signals, school bells, badges, songs, flags and slogans all are symbolic expressions, they stimulate and motivate resultant thinking because they tell us what to do or how to act.

**4. Language:**

Is the most efficient and developed vehicle used for carrying out the process of thinking. When a person reads, writes or hears words or sentences or observes gesture in any language one is stimulated to think. Thus reading and writing of documents and literature also help in stimulating and promoting the thinking process.

**5. Muscular activities:**

Thinking in one way or the other shows the evidence of the involvement of some incipient movements of groups of our muscles. A high positive relation has been found to exist for the thinking and muscular activities of an individual. The more we engage ourselves in thought, the greater is the general muscular tension and conversely as we moved towards muscular relation, our thought processes gradually diminish.

**6. Brain functions:**

Whatever may be the role of the muscles, thinking is primarily a function of the brain. Our mind is said to be the chief instrument of the thinking process. The experiences registered by our sense organs have no meaning, and thus cannot serve as stimulating agents, or instruments for thinking unless these impressions are received by our brain cells and properly interpreted to derive some meaning.

The mental pictures or images can be stored, reconstructed or put to use only on being processed by the brain. What happens in our thought process is simply the function or product of the activities of our brain.

#### Errors in Thinking:

Our thinking, reasoning and problem-solving behaviour all are largely influenced by our “sets”, which is a kind of habit or a way in which we have accustomed ourselves in perceiving certain situations.

Whatever registered earlier in our perceptions or experiences provide the base for our present and future thinking. We won’t change from our preset path of thinking which leads towards a rigid behaviour.

We happen to make mistakes because of our attitude, likes and dislikes, bias or oversimplified thinking, reasoning and problem-solving, etc. These mental sets have been gained from previous experiences surely interfere with our subsequent thinking resulting in ineffective behaviour.

Thus our thinking will be defective and harmful if it is not based on correct data or information. Our biases, prejudices and beliefs sometimes do not enable us to think logically. We make wrong conclusion because of our prejudices, hence we are inclined to ignore and overlook those facts which support right conclusion.

1. Our thinking is defective because we have allowed ourselves to be swayed by our emotions. Many people do not think clearly and accurately during an examination because they have been disturbed by fear and failure.

2. Many times our thinking become fallacious, and cannot view the problem from different angles broadly.

3. Many of our thinking may also be distorted by superstitions or by lack of information that is relevant to the subject.

4. Many of our wishful thinking are also unscientific thinking. Our prejudices and biases cause conflicts, rationalizations and delusions which are defective thinking as well.

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**Theories of Thinking**

**Behaviourist Theory**  
Behaviourists view thinking as something that produces a measureable change in an individual’s actions.  Since thinking takes place as a result of reacting to external stimuli in this model, the educator’s responsibility is to provide an environment rich in stimuli that will cause behaviour to shift in the correct direction. Pavlov’s famous experiment about dogs salivating when they would hear the dinner bell ring is an example of behaviourist theory.

**Humanist Theory**  
In the humanist model, the purpose of thinking is to fulfil an individual’s potential. As such, the acts of thinking and learning are always personal, not institutional. Also known as “whole child” theory, humanists advise that the purpose of education is to develop a self-motivated, autonomous individual who can think and learn on his own. Theorists such as Maslow and Rogers fall into the humanist school, which includes an emphasis on personalised and individualised instruction and rejects the use of standard curricula.

**Social and Situational Theory**  
The fourth major model of thinking and learning is perhaps the least applied theory in industrialised countries today. In this model of thinking, learning occurs as a result of social interaction and the observation of human social behaviour. As such, learning is more of a community endeavour than an individual one. Some social and situational theorists include the natural environment as a part of this community of learning.

The goal of thinking under this model is to achieve full participation of individuals in their respective communities; the environmental branch of this theory would add to that the goal of utilizing natural resources in a responsible and renewable manner.

**Psychoanalytic theory**

Psychoanalysis is a school of psychology founded by Sigmund Freud. This school of thought emphasized the influence of the unconscious mind on behavior.Freud believed that the human mind was composed of three elements: The id, The ego and The superego. The id consists of primal urges while the ego is the component of personality charged with dealing with reality. The superego is the part of personality that holds all of the ideals and values we internalize from our parents and culture. Freud believed that the interaction of these three elements was what led to all of the complex human behaviors. Freud's school of thought was enormously influential, but also generated considerable debate. This controversy existed not only in his time, but also in modern discussions of Freud's theories.

**Cognitive Theory**  
Cognitive theorists such as Piaget and Gagne argue that thinking and learning are internal mental actions that take place in the brain and include sensory perception, processing of information, applying and combining information, and memory. In this model of thinking, the teacher’s role is to structure experiences that will cause individuals to learn through both physical and mental activities.

Cognitive theory stresses the importance of developmental readiness. Experiments have demonstrated, for example, that children below a certain age are not yet able to think in abstract terms; learning must be concrete or it will produce nothing but confusion.

**Piaget's theory**

**Piaget's theory of cognitive development** is a comprehensive theory about the nature and development of human intelligence. It was first created by the Swiss Developmental Psychologist Jean Piaget (1896–1980). Piaget noted that reality is a dynamic system of continuous change and, as such, is defined in reference to the two conditions that define dynamic systems. Specifically, he argued that reality involves transformations and states. **Transformations** refer to all manners of changes that a thing or person can undergo. **States** refer to the conditions or the appearances in which things or persons can be found between transformations.

Piaget proposed four stages of cognitive development: the **sensorimotor**, **preoperational**,  **concrete operational** and **formal operational period**.

**Sensorimotor stage**

The sensorimotor stage is the first of the four stages in cognitive development which "extends from birth to the acquisition of language".In this stage, infants can think about aspects of the environment, even though these may be outside the reach of the child's senses. In this stage, according to Piaget, the development of object permanence is one of the most important accomplishments. **Object permanence** is a child's understanding that objects continue to exist even though he or she cannot see or hear them. Peek-a-boo is a good test for that. By the end of the sensorimotor period, children develop a permanent sense of self and object

[**Pre-operational stage**

Piaget's second stage, the pre-operational stage, starts when the child begins to learn to speak at age two and lasts up until the age of seven. During the Pre-operational Stage of cognitive development, Piaget noted that children do not yet understand concrete logic and cannot mentally manipulate information. Children's increase in playing and pretending takes place in this stage. However, the child still has trouble seeing things from different points of view. The children's play is mainly categorized by symbolic play and manipulating symbols. Such play is demonstrated by the idea of checkers being snacks, pieces of paper being plates, and a box being a table. Their observations of symbols exemplifies the idea of play with the absence of the actual objects involved. By observing sequences of play, Piaget was able to demonstrate that, towards the end of the second year, a qualitatively new kind of psychological functioning occurs, known as the Pre-operational Stage.

**Concrete operational stage**

The **concrete operational stage** is the third stage of Piaget's theory of cognitive development. This stage, which follows the preoperational stage, occurs between the ages of 7 and 11 (preadolescence) years, and is characterized by the appropriate use of logic. During this stage, a child's thought processes become more mature and "adult like". They start solving problems in a more logical fashion. Abstract, hypothetical thinking is not yet developed in the child, and children can only solve problems that apply to concrete events or objects. At this stage, the children undergo a transition where the child learns rules such as conservation. Piaget determined that children are able to incorporate inductive reasoning. Inductive reasoning involves drawing inferences from observations in order to make a generalization. In contrast, children struggle with deductive reasoning, which involves using a generalized principle in order to try to predict the outcome of an event. Children in this stage commonly experience difficulties with figuring out logic in their heads.

**Formal operational stage**

The final stage is known as the **formal operational stage** (adolescence and into adulthood, roughly ages 11 to approximately 15–20): Intelligence is demonstrated through the logical use of symbols related to abstract concepts. This form of thought includes "assumptions that have no necessary relation to reality” At this point, the person is capable of hypothetical and deductive reasoning. During this time, people develop the ability to think about abstract concepts.

Piaget stated that “hypothetico-deductive reasoning" becomes important during the formal operational stage. This type of thinking involves hypothetical "what-if" situations that are not always rooted in reality, i.e. counterfactual thinking. It is often required in science and mathematics.

* **Abstract thought** emerges during the formal operational stage. Children tend to think very concretely and specifically in earlier stages, and begin to consider possible outcomes and consequences of actions.
* **Metacognition**, the capacity for "thinking about thinking" that allows adolescents and adults to reason about their thought processes and monitor them.
* **Problem solving** is demonstrated when children use trial-and-error to solve problems. The ability to systematically solve a problem in a logical and methodical way emerges.

