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## UNIT 4 DEVELOPING THINKING SKILLS

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## 4.1. INTRODUCTION

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“Thinking is the hardest work there is, which is probably the reason why so few engage in it”–Henry Ford

According to Gerett, thinking is a behaviour which is often implicit and hidden and in which symbols (ideas, images, and concepts) are ordinarily employed.

Based on a set of definitions, thinking can be understood as that process where external events of past, present or future are represented internally, and it may also include even a thing or an event which is not directly observed or experienced by the individual. Another set of definition rolls out thinking in terms of a behaviour that leads to finding solution to impending problem.

The various components involved in thinking process are signs and symbols, concepts, motor activities, language, images, experiences, familiarity, and mental operations. A person’s thinking is influenced by a number of factors namely



nature of intellect, mental set, attitude and values, interest and need, habits and adjustment, family and school environment, stages of growth and development, personality factors, mental health, motives, and last but not the least the individual's emotions. In this unit the various aspects related to thinking skills like need and importance of developing thinking skills in children, the different types of thinking, major differences between critical and creative thinking, steps involved in rational decision making, and on how to encourage questioning skills in children has been discussed.

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## 4.2. LEARNING OBJECTIVES

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After going through this unit, you will be able to

- Narrate the need for developing thinking skills in children
- Differentiate between Convergent thinking and Divergent thinking
- Demonstrate the importance of critical thinking for academic success
- Narrate the stages of rational decision making
- Provide conducive environment to develop questioning skills in children
- Prepare and /or use suitable teaching learning material (TLM) and foster thinking skills in classes

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## 4.3. WHY DEVELOPMENT OF THINKING SKILL IN CHILD?

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### *“THINK BETTER TO BE BETTER”*

Being educated is not enough to utilize human potential or to meet the needs of the world of work or to be a good citizen of a country. Children are to be equipped with a varied range of competencies to face an uncertain and unpredictable future. In this era people are exposed to diverse problems in diverse contexts at different times throughout their lives. Nowadays job markets as well as societies are looking out for people who can comprehend, judge and participate in generating new knowledge and processes. Developing countries are in need of citizens who can assimilate information from multiple sources, determining its truth and use it to make sound judgements. Real challenge for the educators is to develop educational programmes that will enable all individuals to become effective thinkers as it is required by all.

### 4.3.1. WHAT ARE THINKING SKILLS?

Thinking skills are the mental processes that we apply when we seek to make sense of experience. It refers to the human capacity to think in conscious ways to achieve certain purposes. Such processes include remembering, questioning,



forming concepts, planning, reasoning, imagining, solving problems, making decisions and judgements, translating thoughts into words and so on. A thinking skill is a practical ability to think in ways that are judged to be more or less effective or skilled. They are the habits of intelligent behaviour learned through practice, for example children can become better at giving reasons, or asking questions the more they practice doing so.

Many researchers have attempted to identify the key skills in human thinking, and the most famous of these is Bloom’s Taxonomy. Knowledge, comprehension, and application are basic or lower order thinking skills while analysis, synthesis, and evaluation are higher order thinking skills.

### 4.3.2. NEED AND IMPORTANCE FOR DEVELOPING THINKING SKILLS IN CHILD

Thinking skills will enable us to learn from our experience and to utilize our intellect. Improving the quality of thinking skill is directly linked to better learning and there by maximize the potential towards betterment of society.

According to Mike Fleetham, “In our evolving world, the ability to think is fast becoming more desirable than any fixed set of skills or knowledge. We need problem solvers, decision makers and innovators. And to produce them we need new ways to teach and learn. We need to prepare our children for their future, not for our past. As a person becomes more proficient, thinkers move from being merely recipients of information to become manipulators and judges of information and ultimately to discoverers and creators of information.

Most of the growth in the human brain occurs in early childhood. By the age of 6, the brain in most children is approximately 90% of its adult’s size. This implies that interventions will be more effective in the early years, while the brain is still growing, than at a later stage. Growing interest in ways of developing children’s thinking and learning skills is the result of finding about how the brain works and how people learn and that specific interventions can improve children’s thinking and intelligence. If thinking is how children make sense of learning then developing their thinking skills will help them get more out of learning and life. A thinking skills approach suggests that learners must develop awareness of themselves as thinkers and learners, practice strategies for effective thinking and develop the habits of intelligent behaviour that are needed for life long learning.



#### Check your progress 1

1. Name the lower order and higher order thinking skills as per Bloom’s taxonomy

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## 4.4. STAGES, TYPES AND TOOLS OF FACILITATING THINKING

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### 4.4.1. STAGES OF THINKING

Research findings indicate that the ability to think is correlated to growth and development of an individual. Infants use more of abstract thinking skills while a grown up person is able to think in abstract terms as well. Theories of Jean Piaget, Bruner and Information Processing explain stage wise development of thinking.

#### 4.4.1.1. PIAGET'S THEORY

Piaget tried to provide a satisfactory explanation of the development of thinking in individuals through the successive stages of cognitive development. In Piaget's views Adaptation underlies cognitive development. Adaptation is the process of building mental representations of the world through direct interaction with it. Two basic components of adaptation are assimilation and accommodation. Assimilation is the tendency to fit new information into existing mental frameworks to understand the world in terms of existing concepts, schemas, and modes of thought. Accommodation is the tendency to alter existing concepts or mental frameworks in response to new information or new recognizable dimensions of the external world. Piaget suggests that the tension between these two components fosters adaptation and cognitive development.

The stages of cognitive development are

- **Sensory motor stage:** infants gradually learn that there is a relationship between their actions and the external world. They discover that they can manipulate objects and produce effects. They know about the world through motor activities and sensory impressions. Towards the end of sensory motor stage an infant develops an understanding that objects continue to exist even when they are hidden from view.
- **Preoperational stage:** In this stage infants acquire the ability to form mental images of objects and events. They start to think in terms of verbal symbols. Though their thought processes are advanced than the previous stage, they are limited by **ego centrism**: they have difficulty understanding that others may perceive the world differently than they do. They lack seriation- ability to arrange objects in order along some dimension. They do not have the



knowledge of **conservation**- knowledge that certain physical attributes of an object remain unchanged even though the outward appearance of the object is altered.

- **Concrete operations stage:** The mastery of conservation marks the beginning of the stage of concrete operations. Children at this stage think more like adults than like younger children at earlier stages. They gain understanding of relational terms and seriation. They come to understand reversibility-the fact that physical changes can be undone by a reversal of the original action. They also begin to use concepts in describing and thinking about the physical world. Children in this stage begin to engage in logical thinking.
- **Formal operations stage:** In this stage children can think abstractly. They become capable of hypothetico-deductive reasoning-involves formulating a general theory and deducing specific hypotheses from it. They are also capable to engage in propositional reasoning-reasoning in which individuals can assess the validity of verbal assertions even when these refer to possibilities rather than actual events.

#### 4.4.1.2. BRUNER'S THEORY

According to Bruner one's thought processes evolve as a result of maturation, training and experiences through a series of sequential stages. The stages are enactive representation, iconic representation and symbolic representation.

- Enactive representation stage is characterized by the child's representation of things and events in terms of motor responses and activities. His thought processes are represented through non verbal activities.
- Iconic representation stage is characterized by the child's representation of things and events in terms of sensory images or mental pictures.
- Symbolic representation stage is characterized by the child's representation of things and events in terms of words, symbols and other abstract phenomena.

#### 4.4.1.3. INFORMATION PROCESS THEORY

- According to this theory, thinking is connected with the information one receives from the environment through one's senses and the nature or thought process depends on how it is utilized by the individual from the time he perceived it until the time he processes it at various depth levels in solving his problem or chalking out a strategy or plan. The stages are sensory processing, retrieval of relevant information from memory and manipulation of information.



#### 4.4.2. TYPES OF THINKING

This session throws light on different types of thinking.

**Convergent thinking** is the type of thinking that focuses on coming up with the single, well-established answer to a problem. It is oriented toward deriving the single best, or most often correct answer to a question.

**Divergent thinking** involves breaking a topic down into its various component parts in order to gain insight about the various aspects of the topic.

**Abstract thinking** is characterized by the ability to use concepts and to make and understand generalizations, such as of the properties or pattern shared by a variety of specific items or events.

**Concrete thinking** is characterized by a predominance of actual objects and events and the absence of concepts and generalizations.

**Reflective thinking** is a part of the critical thinking process referring specifically to the processes of analyzing and making judgments about what has happened. Dewey (1933) suggests that reflective thinking is an active, persistent, and careful consideration of a belief or supposed form of knowledge, of the grounds that support that knowledge, and the further conclusions to which that knowledge leads.

**Inductive thinking** process is often referred to as “generalizing” because it essentially means that one begins with specific details or facts and progresses to a general principle as a conclusion. It is based on probability, not certainty.

**Deductive thinking** Deductive thinking claims that it’s *logically necessary* that if the premises are all true then so is the conclusion.” If deductive logic is used accurately and correctly, accurate points or arguments will lead to an accurate conclusion or result.

**Logical thinking** is the process in which one uses reasoning consistently to come to a conclusion. Problems or situations that involve logical thinking call for structure, for relationships between facts and for chains of reasoning that make sense.

#### 4.4.3. TOOLS OF THINKING

Thinking tools are those techniques that can help us in using our minds systematically and effectively. With the use of thinking tools, the intended ideas will be arranged more systematically, clearly, and easy to be understood. Questioning, Concepts, Mind maps, Cognitive Research Trust (CoRT), are a few tools that facilitate thinking



### 4.4.3.1. QUESTIONING

“A person who asks questions is a person who thinks.”- William Wilen

One of the simplest and easiest ways to develop kids’ thinking skills is by wording questions in the right way. When teachers and parents learn to ask questions that stimulate kids’ thought processes, learning can be fun for children of all ages. Questioning is one approach to motivate others to: get information, test understanding, develop interest, and evaluate the ability of individuals towards understanding certain things.

A W-H question is an influential, inspirational and imaginative checklist to generate:

- Data-gathering questions, during the early stages of problem solving when you are gathering data.
- Idea-provoking questions (e.g. whilst brainstorming). Criteria for evaluating options.

According to Blooms Taxonomy different types of questions require us to use different kinds or levels of thinking. **Knowledge, comprehension, and application** are more **concrete thinking skills**. **Analysis, synthesis, and evaluation** require more abstraction and are known as **critical thinking skills**. To test one’s **Knowledge** skill use words and phrases such as: how many, when, where, list, define, tell, describe, identify, etc., which will draw out factual answers and test child’s recall and recognition skills. To find out **Comprehension** skill use words such as: describe, explain, estimate, predict, identify, and differentiate, etc., to encourage your child to translate, interpret, and extrapolate. To test **Application** skills use words such as: demonstrate, apply, illustrate, show, solve, examine, classify, and experiment, etc., to encourage your child to apply knowledge to situations that are new and unfamiliar. For **Analysing** skills use words and phrases such as: what are the differences, analyze, explain, compare, separate, classify, arrange, etc., to encourage your child to break information down into parts. To test **Synthesis** skills Use words and phrases such as: combine, rearrange, substitute, create, design, invent, what if, etc., to encourage your child to combine elements into a pattern that’s new. To check **Evaluation** skills use words such as: assess, decide, measure, select, explain, conclude, compare, and summarize etc., to encourage your child to make judgements according to a set of criteria.

### 4.4.3.2. CONCEPTS

Concepts are general ideas that we use to identify and organize our experience. If words are the vocabulary of language; concepts are the vocabulary of thought. Aristotle once said that an intelligent person is a ‘master of concepts ‘.



The structure of Concepts involves:

- Sign - word/symbol that names the concept
- Referents - examples of the concept
- Properties - qualities that all examples of the concept share in common.

Concept formation happens through the interactive process of Interpreting and Generalizing. Interpreting is the process of finding examples of the concept while Generalizing is the process of focusing on the common properties shared by a group of things.

#### 4.4.3.3. MIND MAPS

A mind map can be defined as a visual presentation of the ways in which concepts can be related to one another. It's the Ultimate Learning Tool! It helps to save time as it uses only keywords (or concepts), to understand better, to increase one's ability to remember by utilizing the seven principles of Super Memory: Visualization, Association, Making Things Outstanding, Imagination, Colour, Rhythm, and Holism. Mind maps are useful for note taking (listening), oral presentation (speaking) as well as writing

The steps involved in mind mapping

- Draw the topic at the centre.
- Add the Sub-Headings.
- For each Sub-Heading, Add the Main Points and Supporting Details.
- Use your Imagination (pictures/images) to make it outstanding and memorable.

#### 4.4.3.4. COGNITIVE RESEARCH TRUST (CORT)

The essence of the CoRT (Cognitive Research Trust) thinking method is to focus attention directly on different aspects of thinking and to crystallize these aspects into definite concepts and tools that can be used deliberately. It is designed to encourage students to broaden their thinking. CoRT Thinking Tools are C&S: Consequence and Sequel, AGO: Aims, Goals, Objectives (purpose) OPV: Other People's Views APC: Alternatives, Possibilities, Choices, PMI: Plus, Minus, Interesting (ideas), FIP: First Important Priorities and CAF: Consider All Factors.

In **Consider All Factors (CAF)** individual lists down all the factors and consider each factor. In **First Important Priorities (FIP)** individual has to choose from a number of different possibilities and alternatives. In **Plus, Minus, Interesting (PMI)** individual lists down all the plus points, all the minus points and all the interesting points. In **Alternatives, Possibilities, Choices (APC)** individual



generates new alternatives and choices, instead of feeling confined to the obvious ones. In **Other People’s Views (OPV)** individual moves out of one’s own viewpoint to consider the points of view of all others involved in any situation. In **Aims, Goals, Objectives (AGO)** individual picks out and defines the objectives so as one is clear about his own aims and understanding those of others (Purpose). In **Consequence and Sequel (C&S)** individual considers the immediate, short (e.g. 1 - 2 years), medium (e.g. 2 - 5 year) and long term (e.g. over 5 years) consequences.



**CHECK YOUR PROGRESS-2**

2. Enumerate the stages of cognitive development in Piaget’s theory.

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3. Name the CoRT thinking tools?

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**4.5. DEVELOPMENT OF CRITICAL, CONVERGENT, AND DIVERGENT THINKING**

In this era of technological advancement we are bombarded with different genres of information. To face global challenges and crises individuals must that have the capability

- to think independently,
- to relate,
- to evaluate,
- to question,
- to analyse, and
- to think creatively

**4.5.1 CRITICAL THINKING**

Critical thinking is a process that challenges an individual to use reflective,



reasonable, rational thinking to gather, interpret, and evaluate information in order to derive a judgment.

Critical thinking should be the ultimate goal of all education. John Dewey defines critical thinking as “reflective thought” rather than routine thought; it’s the process of “active, persistent, and careful consideration” of the credibility and conclusions of supposed knowledge or information. Teachers should nurture minds to become adept at this kind of critical interaction with information. In order to display critical thinking, students need to develop skills in interpreting, analysing, reasoning, and evaluating. Students who develop critical thinking skills are able to achieve better marks, become less dependent on teachers and textbooks, create knowledge and evaluate, challenge and change the structures in society.

Developing a habit of questioning is basic to critical thinking. According to Edward Glaser there are a few abilities underlie critical thinking. They are ability to

- Recognise problems
- Find workable means to meet those problems
- Gather and marshal pertinent information
- Recognise unstated assumptions and values
- Comprehend and use language with accuracy, clarity and discrimination
- Interpret data
- Appraise evidence and evaluate statements
- Recognize logical connections between statements
- Draw warranted conclusions and generalizations
- Test the conclusions and generalizations arrived at.

#### **4.5.1.1. STAGES OF DEVELOPMENT OF CRITICAL THINKING**

The 6 stages involved in the development of critical thinking are as follows:

- Stage One: The Unreflective Thinker (Individual is unaware of significant problems in thinking)
- Stage Two: The Challenged Thinker (Individual is aware of problems in thinking)
- Stage Three: The Beginning Thinker (Individual try to improve but without regular practice)
- Stage Four: The Practicing Thinker (Individual recognize the necessity of regular practice)

- Stage Five: The Advanced Thinker (Individual advance in accordance with practice)
- Stage Six: The Master Thinker (skilled & insightful thinking becomes second nature)

Development of critical thinking takes place when one:

- 1) accept the fact that there are serious problems in thinking and
- 2) begin regular practice.

### 4.5.1.2. CHARACTERISTICS OF CRITICAL THINKERS

Sir Francis Burton has noticed that the individuals who are regarded as critical thinkers are

- Inquisitive
- See relationships as well as distinctions among things
- Ask questions
- Reflect
- Consider multiple points of view
- Support their viewpoints and argues on the basis of evidence and reasons
- Capable to judge the credibility of sources and make independent decisions about information
- Alert to all deception.

### 4.5.2. CONVERGENT THINKING

Convergent thinking is a term coined by Joy Paul Guilford as the opposite of divergent thinking. It generally means the ability to give the “correct” answer to standard questions that do not require significant creativity, for instance in most tasks in school and on standardized multiple-choice tests for intelligence.

Convergent thinking is the type of thinking that focuses on coming up with the single, well-established answer to a problem. It is oriented toward deriving the single best, or most often correct answer to a question. Convergent thinking emphasizes speed, accuracy, and logic and focuses on recognizing the familiar, reapplying techniques, and accumulating stored information. It is most effective in situations where an answer readily exists and simply needs to be either recalled or worked out through decision making strategies. A critical aspect of convergent thinking is that it leads to a single best answer, leaving no room for ambiguity. In this view, answers are either right or wrong. The solution that is derived at the end of the convergent thinking process is the best possible answer the majority of the time.



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Convergent thinking is also linked to knowledge as it involves manipulating existing knowledge by means of standard procedures. Knowledge is another important aspect of creativity. It is a source of ideas, suggests pathways to solutions, and provides criteria of effectiveness and novelty. Convergent thinking is used as a tool in creative problem solving. When an individual is using critical thinking to solve a problem they consciously use standards or probabilities to make judgments.

#### 4.5.2.1. CONVERGENT THINKING IN CLASSROOM

Convergent thinking can be used practically in many situations. The most obvious use for convergent thinking is when answering multiple choice questions on a test. When a student contemplates the possible answers available, they use convergent thinking to weigh alternatives within a construct. This allows one to find a single best solution that is measurable. In this instance, convergent thinking assesses the available answers and compares them against each other in order to narrow all the options to one best solution.

Convergent thinking is a fundamental tool in a child's education. Today, most educational opportunities are tied to one's performance on standardized tests that are often multiple choices in nature. Thus, it is necessary to promote convergent thinking from a young age, as this will lead children to develop the ability to deduce a single correct solution. The different ways to promote convergent thinking in young children include: jigsaw puzzles that only go together one way or simple math questions that only have a single answer. This will teach children the importance of deducting a single best answer to subjects requiring convergent thinking such as math or tests requiring multiple choices.

#### 4.5.3. DIVERGENT THINKING

The goal of divergent thinking is to generate many different ideas about a topic in a short period of time. It involves breaking a topic down into its various component parts in order to gain insight about the various aspects of the topic. Divergent thinking typically occurs in a spontaneous, free-flowing manner, such that the ideas are generated in a random, unorganized fashion. Following divergent thinking, the ideas and information will be organized using convergent thinking; i.e., putting the various ideas back together in some organized, structured way.

##### 4.5.3.1. METHODS THAT STIMULATE DIVERGENT THINKING

- **Brainstorming:** A technique which involves generating a list of ideas in a creative, unstructured manner. The goal of brainstorming is to generate as many ideas as possible in a short period of time. The key tool in brainstorming is "piggybacking," or using one idea to stimulate other ideas. During



the brainstorming process, ALL ideas are recorded, and no idea is disregarded or criticized. After a long list of ideas is generated, one can go back and review the ideas to critique their value or merit.

- **Keeping a Journal:** Journals are an effective way to record ideas that one thinks of spontaneously. By carrying a journal, one can create a collection of thoughts on various subjects that later become a source book of ideas. People often have insights at unusual times and places. By keeping a journal, one can capture these ideas and use them later when developing and organizing materials in the prewriting stage.
- **Free writing:** When free-writing, a person will focus on one particular topic and write non-stop about it for a short period of time. The idea is to write down whatever comes to mind about the topic, without stopping to proofread or revise the writing. This can help generate a variety of thoughts about a topic in a short period of time, which can later be restructured or organized following some pattern of arrangement.
- **Mind or Subject Mapping:** Mind or subject mapping involves putting brainstormed ideas in the form of a visual map or picture that shows the relationships among these ideas. One starts with a central idea or topic, then draws branches off the main topic which represent different parts or aspects of the main topic. This creates a visual image or “map” of the topic which the writer can use to develop the topic further.
- **Six Thinking Hats:** The premise of the method is that the human brain thinks in a number of distinct ways which can be deliberately challenged, and hence planned for use in a structured way allowing one to develop tactics for thinking about particular issues. Edward De Bono identifies six distinct directions in which the brain can be challenged. In each of these directions the brain will identify and bring into conscious thought certain aspects of issues being considered. Six distinct directions are assigned a colour.
  - **White-** focuses on Data and information
  - **Red-** focuses on feelings, intuition, emotion
  - **Yellow-** focuses on Optimism, Benefits
  - **Black-** focuses on Caution, Critical judgment
  - **Green-** focuses on Creative thinking
  - **Blue** –focuses on Process control, thinking about thinking (meta cognition)



### 4.5.3.2. STAGES OF CREATIVE THINKING

Graham Wallas found that though there were individual differences in the ways creative people thought, there was a recurring pattern. Creative thinking proceeds in five stages.

- **Stage 1-Preparation:** A person who develops a creative solution to an important problem generally spends long periods of time immersed in the problem, gathering knowledge relevant to it and working on it.
- **Stage 2- Incubation:** Creative solutions often emerge after a period of incubation. Incubation refers to the interval during which the person involved stops working actively on the problem and turns to other matters.
- **Stage 3-Illumination:** Creativity does often involve a sudden illumination or insight. At such times, individuals report that they suddenly see the first glimmer of a solution they have been seeking for months or even years.
- **Stage 4-Evaluation:** Considerable refinement must follow illumination. The idea must be worked out, translated into testable form, and then actually tested. Only when evidences indicate that it does work is the creative solution carried out to its final conclusion.
- **Stage 5-Revision:** Frequently the insight turns out to be unsatisfactory and the thinker is back at the beginning of the creative process. In other cases, the insight is generally satisfactory but needs some modification.

### 4.5.3.3. CHARACTERISTICS OF CREATIVE THINKER

Individuals who think creatively seem to have some personality features in common. Evidence obtained from objective and subjective tests indicates that creative people tend to have the following traits:

- They prefer complexity and some degree of imbalance in phenomena
- They are more complex psychodynamically and have greater personal scope
- They are more independent in their judgements
- They are more self assertive and dominant
- They reject suppression as a mechanism for the control of impulse

A personality dimension called origence has been shown to be related to creativity. People high on this dimension “resists conventional approaches that have been determined by others and would rather do his or her thing, even if it is unpopular or seems to be rebellious or nonconforming.

Creative thinkers are found to be

- curious



- seeks problems
- enjoys challenge
- optimistic
- able to suspend judgment
- comfortable with imagination
- sees problems as opportunities
- sees problems as interesting
- problems are emotionally acceptable
- challenges assumptions
- doesn't give up easily: perseveres, works hard

#### **4.5.3.4. BARRIERS TO CREATIVE THINKING**

The unquestioning consensus inhibits an individual's natural creative abilities. Rather than looking for ways to *inspire* creativity, one should just realize the truth. Every individual is capable of creative thinking at all times, but have to strip away the imaginary mental blocks that one has picked up along the way to wherever they are today. A few barriers to creative thinking are prejudice, functional fixedness, learned helplessness, tendency to find the "right" answer, logical thinking, following Rules, being practical, all work, and no play, not ready to try a different job or responsibility, being a "serious" person, avoiding ambiguity, belief that being wrong is bad, and a lack of belief in being creative.

The process of wakening one's creativity is similar to the path reported by those who seek spiritual enlightenment. Individuals are already creative, but it is that they have to strip away all of their delusions to see it.

#### **4.5.3.5. WAYS TO FOSTER CREATIVE THINKING?**

Teachers and significant others in the lives of children can make a difference through fostering creative thinking. The following are the most common ways in which one can foster creativity.

- Develop a broad and rich knowledge base
- Foster independence
- Encourage the use of analogies
- Encourage curiosity
- Enhance positive affect



Notes



**CHECK YOUR PROGRESS-3**

4. What does the blue coloured hat indicate among the 6 thinking hats of Edward De Bono?

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5. Name the steps involved in creative thinking?

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**4.6. EMPOWERING CHILD TO TAKE RATIONAL DECISIONS BASED ON THINKING**

Every living being in this world makes decisions. Decisions are made every second of his life. What to wear, What to buy, What to eat, What to tell, What not to take, What not to use, What not to see....answers are the products of decision making. The effectiveness and efficiency of decisions determine its quality. Each and every aspect of life needs a person to make decisions. The better the decisions the smoother and successful the life is going to be.

**4.6.1. DECISION MAKING**

Decision making is the process of choosing among various courses of action or alternatives. In other words it is a kind of problem solving in which we are presented with several alternatives, among which we must choose. A perfect rational decision maker would consider

- the utility or value of the outcomes each alternative might yield
- the probability that such results would actually occur

Decision will be made on the basis of expected utility, the product of the value and the probability of each possible outcome.

**4.6.2. FACTORS INFLUENCING DECISION MAKING**

The major factors that influence decision making are heuristics, framing, and escalation of commitment.



**Heuristics** are mental rules of thumb that permit us to make decisions and judgments in a rapid and efficient manner. Heuristics are extracted from past experience and serve as simple guidelines for making reasonably good choices quickly and efficiently. Three commonly used heuristics are *availability heuristic*, *representativeness heuristic* and *anchoring & adjustment heuristic*.

**Framing** is another factor that influences the decision making of individuals. Framing is the representation of information concerning potential outcomes in terms of gains or losses. If emphasis of information is on loss then people will not consider that as an option. Human beings have a natural tendency to embrace positive information. Hence framing can have a major effect on decision making

**Escalation of commitment** is the tendency to become increasingly committed to bad decisions even as losses associated with them increase.

### 4.6.3. SIX STEPS DECISION MAKING PROCESS

The six step decision making process is a rational decision making process. It is based upon thinking about, comparing and evaluating various alternatives. The steps are as follows:

- define the situation and the desired outcome
- research and identify options
- compare and contrast each alternative and its consequences
- make a decision or choose an alternative
- design and implement an action plan
- evaluate results

It is widely used in schools to teach children how to make decisions. Six step decision making process is less complex compared to other ethical decision making models. This model is used in organizations so that employees can be empowered to make decisions appropriate to their rank and responsibility.

### 4.6.4. HOW THINKING CAN LEAD TO BETTER DECISION MAKING IN CHILDREN

Possibility to always come up with right and perfect decisions is a mirage. But these guidelines will increase number of better decisions.

- Decisions based on available information and the information that readily comes to our mind need not be the accurate one. So do not blindly trust memory and make decisions as one has to be careful about the possibility of availability. Critical and creative thinking will provide the most accurate information required for making decisions.



Notes

- Never consider situations at its face value. Always dare to question the various possibilities and get doubts clarified. Critical thinking will ensure that the decision you make works in your favour.
- Flexibility should be your key word. As decision making involves lot of effort there is a possibility to be loyal to one’s decisions. If there is a need to change your decision to get better results one should be ready to do so. Critical thinking will help a person not to get trapped in their initial decisions and hence avoid severe consequences.
- While making a decision one should always consider all the available options. One should never be under the assumption that the options known are the only ones available. Critical thinking and creative thinking will come handy in such situations.

Better thinker is a better citizen. As children are tomorrow’s citizens empowering children to make right decisions will make sure that future of the world will be safe and secure in their hands. As rational decision making will help him face life, to overcome peer pressure and live life in the most appropriate way.



**CHECK YOUR PROGRESS IV**

6. Narrate the steps of Rational decision making process.

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**4.7. FACILITATING QUESTIONING SKILL AMONG CHILDREN IN CLASSROOM**

We all use questions in order to get what we want or need; questions are an essential part of the communication system that has evolved in humans and they are certainly helpful in a gregarious species such as ours where we need to exchange information for our survival.

“Rather than teach children answers, we should show them how to ask questions ... then they would discover the answers for themselves.”

**4.7.1 WHAT ARE QUESTIONING SKILLS?**

Questioning skills refer to one’s ability to formulate and respond to questions about situations, objects, concepts, and ideas. Questions may derive from oneself or from other people. There are low-level questions and high-level questions. Low level questions require one to recall information that has been registered in



memory. They operate on the individual's level of knowledge of a subject. Higher level questions require one to process information rather than simply recall it. They operate on one's ability to comprehend, apply, analyze, synthesize, and evaluate information. High-level questions are of two types: description and comparison. Description questions require that one observe or describe an object using illustrations, demonstrations, maps, graphs, or tables. Comparison questions require that one examine two or more objects or ideas and use statements or illustrations to identify similarities and differences.

There are convergent questions as well as divergent questions. The former will have only one correct answer, while Divergent questions can have more than one appropriate answer.

#### **4.7.2. DEVELOPMENT OF QUESTIONING SKILLS IN CHILDREN**

Questions are an essential part of speaking and listening and as such should be introduced from the very earliest age. In terms of pre-school and school experience these skills continue to develop and very young children will respond verbally to questions such as, 'What is this?' when the person playing with them indicates a ball or crayon or may respond by touching or pointing when asked, 'Where is the sand?' It is debateable when the crossover comes from simply hearing and recognising the word 'sand' and knowing that a question has been asked and that it requires an answer. The quality of a child's communication skills will clearly depend in large part on the quality of their early relationships and the environment that they grow up in. For the development of critical thinking, the tendency to question and ask doubts is basic.

#### **4.7.3. USES OF QUESTIONING STRATEGIES IN THE FIELD OF EDUCATION**

Questioning strategies help instructors to- effectively plan class participation activities, to design homework assignments, and to write exams. It also helps them to match their goals or objectives for a subject/course with the actual components of the same. The other functions carried out by questioning strategies are to motivate and to interest, to reveal prior misconceptions, to evaluate, to guide thinking, to discipline, manage, or control, to encourage involvement of passive learners, to diagnose strengths and weaknesses, to understand how students form concepts, to help students form the habit of reflection, to gain insight about students' interests, to increase students' incentive to inquire, to help students learn to construct meaning, to help students set realistic expectations, to summarize information, to relate concepts, to provide student feedback, and to give listening clues.

For students, questioning strategies help to categorize and anticipate exam



questions, allowing for more effective preparation. They are also useful in group study-to test each other's level of subject knowledge and to focus on specific topics. They improve the student's ability to clarify, reorganize, and accurately explain new information. Questioning helps in self-assessment as well as self-monitoring.

#### **4.7.4. ADVANTAGES OF QUESTIONING**

Questions and questioning techniques influence learners' achievement, attitudes, and thinking skills. The level of the question tends to obtain a similar level of answer. Achievement can improve if high levels of questions are accompanied by wait-time, redirection, and probing techniques. One advantage of questioning strategies is they are flexible and widely applicable. They may be tailored to fit the needs of different subjects, various types of information, and different levels of competence. Questioning strategies may be used by instructors and students alike. Students may use the strategies with the help of a facilitator or they may develop the skills on their own.

#### **4.7.5. GUIDELINES TO ENHANCE QUESTIONING SKILLS AMONG CHILDREN IN CLASSROOM.**

- Create an atmosphere of trust and encourage questions.
- Encourage divergent questions.
- Reduce the number of questions that can be answered by only "yes" or "no."
- Do not stop the discussion with the right answer.
- Increase wait-time between asking and answering questions to at least five seconds.
- Provide good halting times.
- Develop sensitive listening techniques.
- Develop silent time.
- Appreciate questions that are appropriate to the developmental level.
- Model good questioning skills.
- Ask them to come up with their own student questions in the lesson, quiz, or assignments.
- Respond in an encouraging way.
- Have interesting topics of discussion.



## 4.8. ROLE OF SCHOOL AND TEACHER IN DEVELOPING THINKING SKILL

Education is the process of human development. Intellectual or mental development is possible by improving the power of thinking. For improving thinking process, the teacher should try to understand his students and the devices for better thinking. Teaching and instructions are planned and organized for improving the power of thinking. The following are the devices used for improving the power of thinking.

- Objectives of teaching and instruction
- Curriculum development
- Preparing textbooks and instructional material
- Methods of teaching and techniques of teaching
- Models of teaching
- Evaluation and diagnosis
- Remedial teaching and instruction

### 4.8.1. HOW TEACHERS CAN STIMULATE THINKING SKILLS IN CHILDREN

- Use teaching strategies that foster *both* the development of thinking skills and the mastery of subject matter under consideration.
- When learners succeed at tasks of any kind, focus their attention on and label the thinking skills that have enabled them to be successful.
- Encourage students to reflect on what they do that is effective and to give names to these processes.
- Model strategies by thinking aloud or by asking students why you did something, when you yourself successfully employ a thinking skill.
- Encourage students to talk to themselves while they think. At early stages, it may be necessary for them to talk out loud; but eventually they should be able to talk silently to themselves about what they are doing.
- Help students over learn basic skills, so that they can afford the leisure to focus on how they are thinking rather than being overwhelmed by the basic skills included in the task at hand.
- Recognize the conditional nature of many thinking skills. Help students realize that what is important of using these skills is in knowing *when* (not just *how*) to use them.



## Notes

- Encourage transfer, emphasize connections within and beyond the topic of a given lesson. Encourage the integration of knowledge acquired on different occasions.
- Provide feedback on the degree to which learners have evaluated their comprehension correctly, not just on the degree to which they have comprehended correctly.
- Emphasize not only knowledge about strategies, but also *why* these strategies are valuable and how to use them.
- Be aware that students may not transfer thinking strategies far from the original setting, unless they are guided to do so. The “Remember when.... Now let’s rule” will help generalize these skills.
- Supply prompts to aid learners in monitoring the methods and depth at which they are processing information. These prompts can range from simple reminders or checklists to detailed scaffolded instruction programs.
- Avoid excessive dependence on external prompting. Although prompts may be necessary in early stages of the development of thinking skills, the ultimate goal is self-regulation.
- Focus on affective or personality aspects as well as the cognitive components of thinking skills.
- Be careful that attention to thinking skills does not detract from learning by competing for limited learning resources that need to be devoted to academic tasks
- Encourage students to work together on higher order activities, so that they can model thinking skills to one another and evaluate the comparative effectiveness of various thinking strategies.

### **4.8.2. CLASSROOM TECHNIQUES EMPLOYED TO DEVELOP THINKING SKILLS OF CHILDREN**

Evidence suggests that brain gym type activities are a useful foundation for the development of thinking skills. Such activities can be used with children from the early years of schooling inwards. These activities encourage students to think in a diversity of ways.

Providing student with verbal tools necessary for the analysis of internalized mental processes is a way to improve thinking. From the early years of primary school, teachers can do much to encourage students to engage in a variety of talk based activities, that in then will help to develop their thinking skill.

As students become confident about expressing their opinion, teachers can use questioning techniques to foster thinking skills.



Thinking hats is a useful concept for a classroom as it will elicit varied responses about a topic.

A number of specific teaching techniques have been identified to help stimulate children's thinking in different subject areas. For eg; Odd One Out is a teaching technique to identify pupil's understanding of key concepts in different subjects. This strategy can reveal gaps in the knowledge that she has taught and the knowledge and vocabulary that the children are able to use. This approach encourages thinking and reasoning.

Concept mapping helps thinking visible and involves writing down. Drawing a central idea and thinking up new and related ideas.

Educational software can act like a teacher to prompt and direct enquiry through asking questions, giving clues and suggesting avenues of investigation. It can also act as a resource while learners discuss and explore ideas, prompting reflection around a simulation. Computers can help develop children's thinking skills when used as part of a larger dialogue about thinking and learning. The challenge for a teacher is to find ways to use the computer to encourage thinking with and discussion between children.

When pupils are taught the habit of effective thinking they grow in confidence, then learning is enriched and they are better prepared to face the challenges of the future.

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## 4.9. LETS SUM UP

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**“The whole of Science is nothing more than a refinement of everyday thinking”.**

**- Albert Einstein**

The benefits of developing thinking ability are manifold. By developing one's thinking skills one can make achievements; can become successful; can shine in social life; can attain emotional, social, and economic maturity and so on. By developing one's thinking abilities it is possible to transform one's aggressive tendencies, bad temper and other negative tendencies creatively and constructively. It has been found by Dr. Edward de Bono that when school students were taught to think effectively, their ill-temper and aggressive tendencies reduced significantly. Clinical Psychologists have also found that when neurotics were taught to think effectively, they showed a remarkable reduction in their neurosis. Researchers have proved that thinking is a skill that can be enhanced by training and practice. Hence it is the responsibility of adults including teachers to nurture thinking skills in children through all possible means to create a better world with great thinkers.



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## 4.10. ANSWERS TO CHECK YOUR PROGRESS

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1. Knowledge, comprehension, and application are basic or lower order thinking skills while analysis, synthesis, and evaluation are higher order thinking skills.
2. Sensory motor stage, pre-operations stage, concrete operations stage and formal operations stage.
3. CoRT Thinking Tools are C&S: Consequence and Sequel, AGO: Aims, Goals, Objectives (purpose) OPV: Other People's Views APC: Alternatives, Possibilities, Choices, PMI: Plus, Minus, Interesting (ideas), FIP: First Important Priorities and CAF: Consider All Factors.
4. Blue coloured hat focuses on Process control, thinking about thinking (Meta cognition).
5. Preparation, Incubation, Illumination, Evaluation and Revision.
6. Defining the situation and the desired outcome, researching and identifying alternatives, comparing and contrasting alternatives and its consequences, choosing the alternative, designing and implementing the action plan and evaluating results.

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## 4.11 ANSWER TO UNIT END EXERCISE

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1. Brain storming technique to find uses of brick.
2. Your question paper should have questions to check lower order thinking skills like Knowledge, Comprehension, Application, as well as higher order thinking skills like Analysis, Synthesis and Evaluation.
3. Conduct a pre-test on a topic to class A and B and note the level of achievement of children. In class A, Use the technique of concept mapping/ mind mapping. No technique is employed in class B. After a specific period of time conduct a post-test on class A and B to note if there is any significant improvement in the children of both classes.

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## 4.13. UNIT END EXERCISES

1. Use any one of the creative thinking techniques to see the level of creativity of your class.
2. Prepare question paper on your subject based on Bloom's taxonomy and discuss it with your class.
3. Do a pre-test and then use a few strategies to stimulate thinking skills in classroom. After significant period of time conduct a post-test to see if there is any significant improvement in the level of achievement of children over a period of time as a result of their improvement in thinking.

It is not enough for a teacher to just teach. A teacher is also a guide and a role model who is the right person to imbibe good values and true spirits in children. A teacher is very capable of bringing about transformation in children to make responsible citizens of them in the future. Empowerment of children is possible by teachers who are affectionate, loving and understanding and motivating to bring the best out of their students.

Notes