Chapter 2

Review of the Literature

2.0 Introduction

In the first chapter, we have discussed the need for teaching thinking in the ESL curriculum. In this chapter, we will review various definitions of thinking along with a conception of thinking as viewed in the current study. Presenting various key debatable issues and findings from the research studies on thinking, it is attempted here to address the misconceptions that thinking cannot be taught. This is followed by the discussion related to language and thought and the relationship between thinking and language skills in the ESL curriculum. Informed by various theoretical frameworks for thinking, a comprehensive list of thinking skills, strategies, and dispositions will be provided in preparation for the intervention programme in the main study. These skills and dispositions in the list will be described elaborately in addition to providing reasons for categorizing them.

2.1 What is thinking?

The term "thinking" has been so elusive and slippery that it resists confinement within clear boundaries, manifesting its effects in every sphere of human life. The ability to think, the richness and subtlety of which is claimed as being unique to our species, is not a natural consequence of human birth. Earlier descriptions of thinking are based on intuition and personal experiences. Only recently did psychologists attempt to explore and explicate the cognitive processes that underlie thinking. To further the discussion on the concept of thinking, it is necessary that we should understand the commonsensical meanings of the term (Thomson, 1959).

- Mental activities such as fantasies, day-dreaming, etc., which are regarded as "imaginative expression[s] of underlying wishes, needs, or wants" (p. 13) are generally viewed as thinking. Dewey (1933) used stream of
consciousness to refer to such mental processes. According to him, they are 'uncontrolled coursing of ideas through our heads' (p. 3). Such kind of thinking is currently labeled by psychologists as autistic.

- Thinking is imagination or mindfulness which is 'usually restricted to things not directly perceived' (Dewey, 1933, p. 5).

- Next, thinking is considered to be believing, which reflects in statements such as "I think it is going to rain tomorrow" (p. 6).

- Finally, thinking is also used synonymously with remembering. This can be observed in the statements such as "Let me think.....yeah...now I got it. I gave the keys to Ramu, not Raju." Here, the word think is used to mean recall.

While these definitions are used in everyday contexts, scholastic conceptualization of thinking could be traced to the period of Greek philosophers. Socrates pointed out inconsistencies in the thinking process of young people during his time. He motivated them, using questioning to understand the significance of seeking evidence, analyzing information, and recognizing fallacious reasoning, etc., and not to blindly accept the ideas of others. This tradition was followed by his disciple Plato who drew people's attention to see through the illusions of the material world. According to him, this is only possible through "intuitive contemplation" (Evans, 2007, p. 9) in which energies need to be directed to pursue the truth through reason and intellect. While Plato thought that observing material manifestations of reality is distracting, Aristotle, the disciple of Plato, stressed on two intellectual techniques—observation and examination. This ancient Greek tradition raised awareness about the need to think systematically through questioning and well-reasoned argumentation. The roots of deductive reasoning are in the Aristotelian syllogisms which consist of conclusions, major and minor premises.

The need for a special and systematic disciplining of the mind was also emphasized by the French philosopher, Rene Descartes. Descartes, who was regarded as the precursor to cognitive science (McGregor, 2007), articulated the connections between logical thinking and brain functioning. He viewed that thinking is reasoning.
and that reason is a chain of simple ideas, linked by applying rules of logic. While Descartes expounded the cerebral basis, the pragmatic basis of human thought was explained by John Dewey. Dewey (1933) explains that human thought is rooted in “some perplexity, confusion, or doubt” (p. 15) and so it is grounded in actual human purposes, goals and objectives. He asserts that reflective thinking is the most important goal of education and this makes an individual take responsibility for his/her own thinking, which helps in participating in democratic processes effectively.

In fact, it might be said that most of the definitions of critical thinking in the existing literature have been inspired by John Dewey’s (1933) reflective thinking, which refers to a chain of thinking processes that lead to a solution or conclusion through enquiry: “Activ, persistent and careful consideration of any belief or supposed form of knowledge in the light of the grounds that support it and the further conclusions to which it tends constitutes reflective thought” (p. 9).

The pragmatic notion underlying the definition of Dewey can also be found in the definitions of thinking offered by various experts. Some of them are given below:

Bartlett (1958) asserts that “thinking ... [is] not simply the description, either by perception or by recall, of something which is there, it is the use of information about something present, to get somewhere” (p. 74). He defines thinking as

The extension of evidence in accord with that evidence so as to fill up gaps in the evidence: and this is done by moving through a succession of interconnected steps which may be stated at the time, or left till later to be stated. (p. 75)

In other words, thinking includes interpolation, extrapolation and reinterpretation.

Baron (1991) defines thinking as a “conscious response to doubt or ignorance” (p. 169), which entails search for possibilities, evidence, and goals. Possibilities refer to the likely solutions or answers, evidence helps in deciding among the possibilities, and goals are the criteria used to weigh evidence.

Ruggiero (1988) views thinking as “any mental activity that helps formulate or solve a problem, make a decision, or fulfill a desire to understand. It is searching for answers or reaching for meanings” (p. 2).

Philip Adey emphasizes the purposive nature in his description of thinking:
Something we do when we try to solve problems; it involves processing the information that we have available to us—either from the external world or from within our own memories. Thinking allows us to take things we know or observe and turn them into new ways of understanding. (Adey, et.al., 2001, p. 2)

More recently, Moseley, et al. reviewed about fifty frameworks on thinking and described thinking as a 'consciously goal-directed process, such as remembering, forming concepts, planning what to do and say, imagining situations, reasoning, solving problems, considering opinions, making decisions and judgments, and generating new perspectives’ (Moseley, et al., 2005, p. 12).

On closer observation of the above overarching constitutive definition, it can be understood that the skills involved in thinking are underscored. Since thinking is a verb, the performance component is an essential part in the definition. However, from an education point of view, the disposition to think is vital to the thinking processes. In recent initiatives to teach thinking in various countries, concerns were raised by experts about the dangers of viewing thinking only as a skill.

...thinking is not an incidental skill like being able to swim. Thinking is constitutive of our humanity and of who we are, and is related to a commitment to truth. At stake here are the complex connections between knowledge, virtue and education. Thinking skills are often presented as tools, thus emphasizing their separation from our dispositions, our values and our personality; tools reveal little about the nature of those who use them. (Johnson, 2010, p. 38).

Before we look at the definition of thinking as conceived in the study, it is important to understand the relationship between thinking and a few terms that are synonymously used with it.

2.1.1 Thinking and other related concepts.

Cuban (1984) notes, “Defining thinking skills, reasoning, critical thought and problem solving is troublesome to both social scientists and practitioners. Troublesome is a polite word; the area is a conceptual swamp” (p. 676). Little progress has been made in clearing this conceptual swamp. There is confusion among the terms higher order thinking, critical thinking, creative thinking, and problem-solving.
In spite of the perceived difficulty in disentangling the concept of thinking, it is attempted here to distinguish between thinking, as described here, and other related terms. Among the related terms, two of them, higher-order thinking skills and critical thinking, come closer and often are the source of confusion.

For higher-order thinking skills, reference is generally made to the three top categories, analysis, synthesis, and evaluation, of Bloom's taxonomy. It is obvious from this that the other thinking skills such as recalling, comprehending, and applying are excluded in the construct of higher-order thinking skills. But, thinking, as described in the study, includes all cognitive skills—lower-order as well as higher-order.

Critical thinking is another term which is used synonymously with thinking in educational contexts. However, when we investigate the initial descriptions of critical thinking for instance, by Robert Ennis and Edward Glaser, they seem to have been derived from the Greek kritikos, i.e., judge or evaluate. Besides, many of the definitions of critical thinking do not lay an overt emphasis on metacognition and creative thinking, which will be explained in detail in the following sections. Consequently, there lies a confusion, from the pedagogic standpoint, whether creative and metacognitive thinking are a part of critical thinking. Besides, the confusion is exacerbated by the very epithet critical, which is generally understood as criticize. This forms a strong rationale for arriving at a working definition of thinking for the current study.

The term intelligence is so ingrained in the minds of educators and parents that gigantic efforts were expended by the psychologists like Howard Gardner and Daniel Goleman, questioning the notion that it is fixed and unitary. With his deliberate plural use of intelligence, Gardner attempted to change the well-established notion that it is a fixed and unitary trait. His theory has been highly popular in the field of education though it was not initially aimed at education. The multiple intelligences are domains that provide macro level descriptions of intelligence. The skills and abilities and their procedural components under each type of intelligence have not been clearly articulated. At the level of designing, performing, and evaluating a task that is aimed
at developing thinking abilities, the types of intelligences can be used as a resource only at a broad level. For example, to develop the ability to identify similarities and differences, certain questions arise. Which type of intelligence is the source for this skill or ability? Does it come under kinaesthetic, linguistic, logical, interpersonal or all the above? If two students were asked to give a speech and the rest of the students in the class were given the task of comparing and contrasting the two speeches, most probably, the task demands linguistic intelligence. However, on closer observation, it is also related to kinaesthetic intelligence since the students also compare the body language of the speaker-students. Yet it could be logical intelligence in that the speaker-students provide evidence to support their argument.

In the above example, we can understand that the skill/ability of identifying similarities and differences is so generic a thinking skill that it pervades all domains of the curriculum. Therefore, the multiple intelligences can be regarded as modalities rather than constituents of thinking. Furthermore, thinking dispositions don't find a place in the theory of multiple intelligences. Despite the success of the theory in enlightening educators about the importance of other domains such as music and play alongside the traditional verbal and mathematical intelligence, the theory does not articulate the skills, abilities, and dispositions of thinking clearly.

2.1.2 Cognition and thinking

One might equate thinking skills with cognitive skills, but this does not represent the wholeness of thinking. The term cognitive lets one understand that cognitive skills are value-neutral. In addition, dispositions and metacognitive thinking also attract affective domains.

Further, since thinking has been the subject of philosophy and psychology and teaching thinking essentially draws from both the fields, a term that can represent the two traditions would be more appropriate, and therefore the term thinking was chosen.

As a result, thinking may be defined as a consciously goal-directed process, such as remembering, forming concepts, planning what to do and say, imagining situations, reasoning, solving problems, considering opinions, making decisions and
judgments, and generating new perspectives; which are stimulated by dispositions to be inquisitive, open-minded, orderly, analytic, truth-seeking, and metacognitive, etc.

The definition of thinking provided above is not entirely new. Moseley, et al.'s (2005) definition of thinking is extended here to include the dispositional aspect (as indicated in bold). The inclusion of dispositions suggests that they are an essential part of thinking. The dispositional part of the definition addresses the misconception that thinking is similar to any kind of ordinary skill such as swimming. Though such a view of treating thinking as a skill supports the pedagogy of thinking, only a skill-view cannot capture the full spectrum of thinking and its constituents. The description of thinking presented above informs the current study to articulate the constituents of thinking.

To sum up, the kind of thinking that we refer to is not the unconscious, unintentional, or intuitive thinking that includes day-dreaming, etc. It is goal-oriented and directed towards solving a problem or making a decision. It is deliberate and requires conscious effort. The definition is provided mainly from a pedagogical perspective. Whereas the definition provided here is constitutive in nature, there are various frameworks for thinking, which have described the constituents of thinking. The following sections offer a comprehensive view on the construct of thinking.

2.2 Frameworks for thinking

The concept of thinking that was described above is derived from various conceptual frameworks for thinking, which have had remarkable impact on today's education system across the world. In the following sections, a brief review of these models is presented under three heads—the frameworks that describe 1) cognitive structure, skills or abilities 2) thinking skills and dispositions 3) dispositions.

2.2.1 Frameworks of cognitive structure, skills, or abilities

Under this category, we will discuss the models of cognitive development by Jean Piaget, and Howard Gardner. While these two models focus on the structure of
Intellect, Bloom's taxonomy, which has influenced the instructional design profoundly, is also discussed under this head.

2.2.1.1 Piaget's structure of cognitive development

Piaget suggested that cognitive or intellectual development in a child is a continuous process, which progresses through a universal and fixed series of stages. He asserted that children always think and learn as a result of two basic inherited tendencies, i.e. organization and adaptation. With the help of the principle of equilibration, he explained that the goal of human mental activity is “to reconcile new knowledge and experience” (Biehler & Snowman, 1990, p. 61) with the existing schemes.

According to him, cognitive development in humans takes place through four stages—sensorimotor (0 to 2 years), pre-operational (2 to 7 years), concrete operational (7 to 11 years), and formal operational (11 years and older). During sensorimotor stage, the infant gains understanding of the world through “motor and sensory skills” (Moseley, et al., 2005, p. 190). Gradually, the schemes which were physical in nature begins to become more mental in the pre-operational stage. During this period, children can form new structures of knowledge but are unable to think logically because of perceptual centration (tendency to focus attention on only one characteristic/attribute at a time), irreversibility (inability to mentally visualize a physical activity/mental operation reversibly), and egocentrism (assumption that others see things the same way they see). By the age of seven, children begin to decentre through assimilation and accommodation, a stage which Piaget calls concrete operational stage. They become capable of mentally reversing actions as in logic-based tasks—“classification, serial ordering, equalization, correspondence, etc.” (Piaget & Inhelder, 1958, p. 247). However, operational thinking “cannot be immediately generalized to all physical properties” (p. 249) but limited to the objects that children experience concretely and directly. When children reach a point where they are able to deal with abstractions and engage in mental manipulations, they are said to have reached the stage of formal operations. Thinking in this stage is “hypothesico-deductive” (p. 251) and “it no longer deals with objects directly but with verbal elements” (p. 252) engaging in propositional thought.
Piaget views the child as an active thinker and his theory highlighted a number of significant aspects in teaching children how to think. His theory has been highly influential in the development of thinking skills intervention programmes and in the derivative generation of other taxonomies, models or stages of thinking that were applied to the teaching of academic subjects (Moseley, et al., 2005, p. 193).

2.2.1.2 Gardner’s multiple intelligences

Howard Gardner proposed the theory of multiple intelligences (MI) as a response to “the classical view of intelligence” (Gardner, 1993, p. 5) that viewed intelligence as a unitary and fixed capacity which could be measured by IQ tests. While Gardner does not deny that “g” (stands for general intelligence) exists as a phenomenon, he questions its construct that is purely explained in terms of linguistic and logical intelligence as measured by the IQ tests (Gardner, 1993, p. 39). Gardner suggests that “the mind is organized into relatively independent realms of functioning” (p. 120). He defines intelligence as “the ability to solve problems, or to fashion products, that are valued in one or more cultural or community settings” (p. 7). The key notion in the theory is the nature of intelligence. For Gardner, intelligence is essentially a “biopsychological potential” (p. 36) rather than a product, a process, a content, or a style.

As against the narrow conception of intelligence that centred on linguistic, logical, and mathematical abilities, he initially “identified seven intelligences or types of thinking” (Robson, 2006, p. 34) in 1983 and added the eighth one, Naturalist intelligence, in 1995:

- Linguistic (ability to learn and capacity to use language);
- Logical-mathematical intelligence (capacity to analyze problems logically);
- Musical (ability to appreciate and compose music);
- Bodily-kinaesthetic (ability to use body to solve problems and fashion products);
- Spatial (ability to recognize and manipulate patterns of space and visual stimuli);
- Interpersonal (sensitivity to others’ emotions and mental states);
Intrapersonal (capacity to understand oneself and regulate one's own life)

Naturalist (capacity to recognize and categorize natural objects)

The above intelligences represent various ways of thinking and are connected with different areas of experience.

With respect to critical thinking as a general capacity, Gardner explains that people engaging in various professions or domains value critical thinking but the kind of thinking required is domain-specific and so, "one needs to develop the forms of critical thinking that are relevant to that particular domain" (p. 44). Nevertheless, he endorses the idea of developing certain general thinking skills that cut across domains: "certain habits of thought, such as taking one's time, considering alternatives, sharing one's work with another colleague, assuming the perspective of other persons, may well prove useful across domains" (p. 44).

Further, Gardner suggests that each of the above thinking skills "must be practised explicitly in every domain where it might be appropriate" (p. 44) and asserts that if a more general virtue like considering other points of view has to be developed we need to ensure that "the lessons of critical thinking are deliberately revisited in each of the relevant classes or exercises" (p. 44).

2.2.1.3 Bloom's taxonomy of educational objectives

Bloom's taxonomy has been widely accepted by curriculum designers, teachers, administrators, and researchers. This taxonomy was originally developed to promote "the exchange of test materials and ideas about testing" and of "stimulating research on examining and on the relations between examining and education" (Bloom, 1956, p. 4) through a system of classifying the goals of the educational process. The authors of the taxonomy claimed that it was aimed at "classifying the intended behaviour of students—the ways in which individuals are to act, think, or feel as the result of participating in some unit of instruction" (p. 12). The taxonomy also serves as an "aid in developing a precise definition and classification of such vaguely defined terms as 'thinking' and 'problem solving'" (p. 10).

This taxonomy was originally planned in three major parts— the cognitive, the affective, and the psychomotor domains. The cognitive domain, published in 1956,
deals with “the recall or recognition of knowledge and the development of intellectual abilities and skills” (p. 7). The taxonomy mentioned hereafter refers to the cognitive domain.

Bloom’s taxonomy consists of six major categories with Knowledge at the lowest and Evaluation at the top of the hierarchy. The categories are as follows:

1) Knowledge (specific terminology, facts; ways and means of dealing with specifics; and the universals and abstracts in a field);
2) Comprehension (translation from one level of abstraction to another, one symbolic form to another form, one verbal form to another; interpretation; and extrapolation);
3) Application (use of abstractions such as rules, ideas, technical principles, theories, in particular and concrete situations);
4) Analysis (a set of abstract notions, elements, organizational principles);
5) Synthesis (production of a unique communication, a plan, etc);
6) Evaluation (judging against internal/external criteria).

While Bloom’s taxonomy is acclaimed as “neutral” and encouraging critical thinking through “mindful analysis, synthesis, and evaluation” (Paul, 1985, p. 37) providing seminal insights into cognitive processes, it has been subject to criticism on certain grounds.

One of the chief questions is whether metacognition figures in the taxonomy. Though the term was not in vogue by the time the taxonomy was developed, when the categories are applied to self-knowledge and self-monitoring, metacognition manifests (Moseley, et al., 2005, p. 52). However, the relationship between cognition and metacognition was not clearly articulated in the taxonomy, where the latter is considered second-order cognition.

Another criticism is that its cumulative hierarchy is problematic. A number of authors criticised Evaluation category being placed on the top of the hierarchy. In fact, Ormell (1974) suggests that the six categories should be treated as parallel and the cumulative hierarchy needs to be abandoned.
Anderson and Krawthwohl's revision of Bloom's taxonomy

The revision of Bloom’s taxonomy was undertaken in the light of advances in knowledge, and changes in the way of thinking about the practice of education; and a need “to refocus the educator’s attention on the value of the original” (Anderson & Krawthwohl, 2001, p. xxi) taxonomy. Accordingly, the following changes were made:

- The revised taxonomy emphasized planning curriculum, instruction, and assessment whereas the original taxonomy focused mainly on assessment.
- Instead of one dimension in the original taxonomy, the revised version has two dimensions—Knowledge and Cognitive processes.
- Subcategories and their components were given major emphasis.
- In the knowledge dimension, the subcategories were renamed as Factual Knowledge, Conceptual Knowledge, Precedural Knowledge, and a new category was added, i.e. Metacognitive Knowledge.
- The noun forms of major categories and subcategories in the cognitive processes dimension were replaced with verb forms.
- The titles Comprehension and Synthesis were renamed as Understand and Create respectively in the cognitive processes dimension.
- Cumulative hierarchy of the categories was not claimed. However, the taxonomy was an overall hierarchy in terms of increasing complexity.
- The order of the categories Create and Evaluate were interchanged.
- Sample assessment tasks were included to clarify the meaning of various subcategories.

The revised version was restricted to only cognitive domain on the grounds that integrating it with the other two domains, i.e. affective and psychomotor, results in a very complex taxonomy. However, the authors maintained that it contained links to the affective domain in the Metacognitive knowledge. They recognised the skills and abilities in critical thinking and problem solving in that they were covered under the subcategory Understand.

Though the frameworks presented above discusses the structure of intellect, the following frameworks deal with thinking skills and dispositions.
2.2.2 Frameworks of thinking skills and dispositions

2.2.2.1 Ennis’ taxonomy of critical thinking

Robert Ennis (1985b) defines critical thinking as “reasonable, reflective thinking that is focused on deciding what to do and believe”. He has developed a taxonomy of “goals for critical thinking” (p. 46). The features of the taxonomy, according to Ennis are as follows:

- It reflects what people actually do and believe;
- It includes both dispositions and abilities;
- It can be used to teach critical thinking across the curriculum or as a separate programme;
- It helps in the assessment process.

His taxonomy of critical thinking includes both dispositions and abilities. The construct of the taxonomy is as follows (Ennis, 2001):

Dispositions

Critical thinkers are characterized by three broad dispositions:

1) They tend to care that their beliefs be true and their decisions be justified. Critical thinking dispositions include the following sub-dispositions: a) seek alternatives (hypothesis, explanations, conclusions, plans, sources) and be open to them; b) endorse a position to the extent that, but only to the extent that, it is justified by the information available; c) be well-informed; and d) consider seriously other points of view

2) They tend to care about presenting their or others’ position honestly and clearly. The sub-dispositions include a) be clear about the intended meaning in communication precision; b) determine and maintain focus on the conclusion or question; c) seek and offer reasons; d) take into account the total situation; e) be reflectively aware of basic beliefs.

3) They need to have a concern for the dignity and worth of every person. This includes the following sub-dispositions: a) discover and listen to others’ views and
reasons; b) avoid intimidating or confusing others taking into account the feelings and level of understanding; and c) be concerned about the welfare of others.

While the first two major dispositions are constitutive, i.e. they are part of Ennis’ definition of critical thinking, the third one is correlative. That is, it is not integral but desirable. Nevertheless, Ennis highlights it by cautioning that exercising critical thinking without the third disposition might not be valuable and might even be “dangerous” (p. 44).

Abilities

Critical thinkers, according to Ennis, have 15 key abilities, which fall into two main categories, namely: constitutive abilities and auxiliary abilities.

The Constitutive abilities: There are 12 critical thinking abilities. These form the core of critical thinking. Critical thinkers have the ability to

**Clarification**
- focus on a question
- analyze arguments
- ask and answer questions of clarification or challenge
- define terms and judge definitions and deal with equivocation

**Basis for decision-making**
- judge the credibility of a source
- make observations and judge observation reports

**Inference**
- deduce and judge the deductive validity of an argument
- induce and judge the inductive validity of an argument
- make and evaluate value judgements

**Advanced clarification**
- define terms and judge definitions
- attribute unstated assumptions

**Other abilities**
- engage in *suppositional thinking* i.e., to consider and reason from premises, etc., that they doubt without letting the doubt or disagreement interfere with their thinking.
- integrate the other critical thinking abilities and dispositions

**The Auxiliary Abilities**

There are 3 auxiliary abilities that are very helpful but do not form the core of critical thinking.

Critical thinkers have the ability to
- proceed in an orderly manner appropriate to the situation;
- be sensitive to the feelings, level of knowledge, and degree of sophistication of others;
- employ appropriate rhetorical strategies in discussion and presentation.

Ennis states that his taxonomy does not suggest any level, grade, sequence, and the emphasis on infusion in a specific subject area. He also acknowledges that the categories might be either exclusive or overlapping. As such, the taxonomy is deemed as a list of abilities and dispositions.

Ennis points out that his definition includes creative thinking and his concept of critical thinking is not equivalent to higher-order thinking. While he points out that higher-order thinking is so vague a concept that it is less useful for educational purposes (1985a), he agrees that his concept of critical thinking “does not exhaust the notion of high-order thinking” and it forms “at least a significant portion of higher-order thinking” (p. 47).

### 2.2.2.2 Marzano’s taxonomy of educational objectives

With an aim to produce a theory based on meta-analysis of teaching, Marzano (2001) came up with a taxonomy that can aid educators to formulate educational objectives.
Fig. 2.1 Marzano’s taxonomy of educational objectives

Extending Bloom’s taxonomy, Marzano (2001) incorporates a wide range of aspects that affect how students think and provides a research-based and theory-driven framework that aims at developing students’ thinking.

The taxonomy is a hierarchical system in which self system controls the metacognitive system, which in turn regulates the cognitive system (see Fig. 2.1). Knowledge can be represented linguistically, non-linguistically, or in an affective form. The three systems above the knowledge domain form a hierarchy from top to bottom in that each level among these three systems requires more conscious thought than the system below them.

At the top is the self-system, which includes the functions of examining the importance of knowledge, ability to learn, and emotions associated with knowledge and motivation (Marzano, 2001, p. 284). By including the affective domain, Marzano attempted to address the limitation of the Bloom’s taxonomy. Nevertheless, it should be noted that only cognitive domain of the Bloom’s taxonomy is popular whereas the affective domain part of the taxonomy is less known.

With the inclusion of affective elements, Marzano’s taxonomy embraced the dispositional aspect of thinking. The self-system is said to control the metacognitive
system whose function is goal specification, process specification, process monitoring, and disposition monitoring (Moseley, et al. 2005). Knowledge domain is comprised of declarative and procedural knowledge. Knowledge retrieval, according to Marzano, is a prerequisite for comprehension and analysis.

The scope of the taxonomy is broad and covers mental processes, values, beliefs, and dispositions (Moseley, et al., 2005) though the sub-dispositions are not clearly articulated. Moreover, there is little discussion about creative thinking as a result of which the skills and abilities under it don’t figure in the taxonomy.

Now, we shall examine the frameworks that describe only dispositions.

2.2.3 Frameworks for dispositions

Thinking is characterological (Ritchhart, 2002). Although not captured in the traditional theories of intelligence or cognitive development, thinking dispositions are well represented in our everyday lives when we use expressions such as inquisitive, open-minded, strategic, systematic, curious, etc. to refer to intelligent people. In using these expressions we do not refer to the abilities or transient states, rather we define their character whose permanence and depth is suggested. Character entails attitudes, beliefs, habits, sensitivities, inclinations and dispositions. It is obvious that dispositions are not abilities, skills, or strategies. Before we begin to see different kinds of thinking dispositions, let us look at the need recognized by Dewey (1922) for such a term:

“But we need a word to express the kind of human activity which is influenced by prior activity and in that sense acquired; which contains within itself a certain ordering or systematization of minor elements of action; which is projective, dynamic in quality, ready for overt manifestation; and which is operative in some subdued subordinate form even when not obviously dominating activity. Habit even in its ordinary usage comes nearer to denoting these facts than any other word. If the facts are recognized we may also use the words attitude and disposition” (p. 41).

As we can see, a disposition refers to a tendency and willingness that motivates one to do a set of actions and respond to the world. The meaning of the word disposition is slightly problematic and needs clarification. Gilbert Ryle (1949, p. 43) describes dispositions as inherent capacities or properties of an object or person that must be
brought out by an external force or agent. This means there is quality of *permanent proneness* in persons or objects that is stimulated by external circumstances. In contrast to philosophers, psychologists view dispositions as "voluntary elicitors rather than automatic emitters of behavior. Thus, although the environment may prompt dispositions, dispositions represent a consciously controllable response rather than a completely unconscious or automatic response" (Ritchhart, 2002, p. 21).

Therefore, thinking dispositions represent characteristics that animate, motivate, and direct our abilities toward good and productive thinking and are recognized in the patterns of our frequently exhibited, voluntary behavior. Dispositions not only direct our strategic abilities but they help activate relevant content knowledge as well, bringing that knowledge to the forefront to better illuminate the situation at hand. Unlike desire, dispositions are accompanied by behavior and thus assume the requisite ability to carry out that behavior. In contrast to habitual routines, dispositions invoke a general class of responses rather than specific actions. Collectively, the presence and force of these dispositions make up our intellectual character. (p. 21).

In the following sections, a review of the frameworks that describe dispositions is presented.

### 2.2.3.1 Facione and Sanchez's seven sub-dispositions

Several of the critical thinking experts use the expression **critical spirit** to refer to the thinking dispositions. Working with experts from various disciplines, Peter Facione proposed an overall disposition toward critical thinking that consists of seven sub-dispositions: *Truth-seeking, Open-mindedness, Analyticity, Systematicity, Self-confidence, Inquisitiveness,* and *Maturity.* A brief discussion of these sub-dispositions is provided below (Facione & Facione, 1993).

**Truth-seeking** refers to the disposition of being eager to seek the truth, courageous to ask questions, objective and fair-minded even though the information is not compatible with pre-conceived notions. For a truth-seeker, knowing the truth is more important than winning the argument.

**Open-mindedness** describes the disposition to accept divergent views with the awareness of the possibility of personal bias. The person with this disposition respects the rights of others as well as his own.
Analyticity involves the disposition to be cautious to anticipate problems and its consequences. The analytical person looks for reasons for a situation toward resolving the problems.

Systematicity is the disposition of being organized, focused, and industrious in inquiry. Issues and problems are approached in an orderly and focused manner.

Self-confidence refers to the degree of faith one has on one’s thinking processes. People who have self-confidence trust themselves to make judgments and believe others to look to them to solve problems and make decisions.

Inquisitiveness describes the disposition of intellectual curiosity. An inquisitive person wants to be well-informed, know how things work, and values learning.

Maturity refers to how disposed a person is toward making reflective judgments with the knowledge that there are different constraints and options.

2.2.3.2 Richard Paul’s model of critical thinking

Richard Paul’s model of critical thinking has strong philosophical underpinnings. According to him,

Critical thinking is disciplined self-directed thinking which exemplifies the perfections of thinking appropriate to a particular mode or domain of thinking. It comes in two forms. If the thinking is disciplined to serve the interests of a particular individual or group, to the exclusion of other relevant persons and groups, I call it sophisticated or weak sense critical thinking. If the thinking is disciplined to take into account the interest of diverse people or groups, I call it fair-minded or strong sense critical thinking. (Paul, 1993, p. 33)

Paul’s model of critical thinking contains four parts: elements of reasoning or thought, standards of critical thinking, intellectual abilities, and intellectual traits. While the first three are the essential components of critical thinking, the last component entails a set of thinking dispositions. Although Paul’s earlier versions of critical thinking had intellectual abilities or cognitive strategies, the recent versions emphasize the dispositional elements of his model, which is the reason for including this model in the dispositional frameworks.
Elements of Reasoning: These parts of thinking are the fundamental structures of human thought: purposes, questions, points of view, information, inferences, concepts, implications, and assumptions. These eight elements are present in everyday contexts and the ability to recognize them is highly essential to critical thinking.

Standards of critical thinking: The twelve standards described in the model help to check the quality of critical thinking. They are clarity, precision, specificity, accuracy, relevancy, consistency, logic, depth, completeness, significance, adequacy, and fairness. Gaining mastery of these elements and standards are essential for reasoning well.

Intellectual abilities, according to Paul, are composed of a process, an object, and a standard, for instance, in an intellectual ability such as identifying premises accurately, identifying refers to the process, premises refers to the object, accurately refers to the standard. A comprehensive list of macro- and micro-cognitive strategies was listed by Paul. These strategies were intended to help in redesigning lessons to develop critical thinking. However, these abilities don’t figure in the recent versions of critical thinking.

Intellectual Traits dimension of the model focuses on the thinking dispositions. Paul & Elder (2002) identified a number of traits or dispositions that they consider to be essential to (strong sense) critical thinking. Paul views these traits as the affective and moral dimensions of critical thinking and asserts that “[g]iven the deep social conditioning, he believes it unlikely that anyone currently meets his definition of master thinker” (Moseley, 2005, p. 167). The following brief description has been taken from Paul & Elder (2002, pp. 17-35).

Intellectual humility refers to the awareness of one’s knowledge. It is possible that our own false beliefs, assumptions, misconceptions, prejudices, illusions, or ignorance might appear to us as the truth. Rather than recognizing and taking further steps to guard ourselves against them, we might ignore, obscure, or choose not to believe the bounds of our knowledge. Intellectual humility is essential in such situations.
Intellectual courage is defined as having consciousness of the need to face and fairly address ideas, beliefs, or viewpoints towards which one has strong negative emotions. The disposition means standing up for the truth and questioning the state of affairs and not being afraid of being proven wrong.

Intellectual empathy lies in the awareness of the necessity to identify oneself with others to understand them better. It involves accurately understanding the viewpoints and the reasoning behind such views. A good thinker should have intellectual empathy in order to function effectively in life and participate in the democratic processes.

Intellectual integrity is defined as recognition of the need to be true to one’s own thinking and to hold oneself to the same standard one expects others to meet. Admitting the discrepancies and inconsistencies in one’s own thinking is a part of Intellectual Integrity.

Intellectual perseverance is the disposition to continue to put efforts through intellectual complexities even when faced with frustrations that accompany the situation. This quality is highly essential in ill-structured problems. On the face of them, they appear to be monstrous and gigantic. Initial attempts might prove futile. It is then that the disposition of not giving up should come into play. One needs to sustain one’s thinking process until one gets to the crux of the issues towards resolving them.

Faith in reason is based on the belief that one’s own higher interests and those of humankind will be best served by giving the freest play to reason. When a person has confidence in reason, he or she can also be convinced by reason. The idea of reasonability is one of the most fundamental criteria by which we judge for believing ideas and viewpoints.

Fair-mindedness includes an awareness of the need to treat all viewpoints alike. To be fair-minded means giving equal importance to others’ views without enslaving oneself to one’s own prejudices and biases.
Paul's model has conative, cognitive, and affective components. The model has often been criticized for being too Western in orientation. There is little emphasis on creative thinking. Metacognitive thinking figures less prominently though it is implicit in the Intellectual Integrity. Nevertheless, Paul's model is extensively helpful for teachers of thinking in designing and redesigning lessons across the curriculum.

2.2.3.3 The seven thinking dispositions

Perkins et al. (1993a) would not support the idea of treating dispositions as solely motivation. Disposition, according to them, is a psychological element that entails three components: inclination, sensitivity, and ability. Inclination is the felt need toward some behavior when a person perceives the need to exercise that disposition. Contrastingly, sensitivity refers to the alertness towards situations that demand a thinking disposition. Lastly, ability refers to the actual ability to follow through some behavior. Perkins et al. posit that unlike other accounts of dispositions proposed by experts like Jonathan Baron, whose descriptions present a dichotomy between abilities and dispositions, theirs include a trio of inclination, sensitivity, and ability, which form "ir indi vidiuall i necessary and jointly sufficient conditions for behavior" (p. 10). Good thinking according to them can be characterized as "reflecting seven thinking dispositions; They are

- The disposition to be broad and adventurous
- The disposition toward sustained intellectual curiosity
- The disposition to clarify and seek understanding
- The disposition to be planful and strategic
- The disposition to be intellectually careful
- The disposition to seek and evaluate reasons
- The disposition to be metacognitive

2.2.3.4 Costa and Kallick's sixteen habits of mind

Expanding on the 12 attributes of intelligent behavior (Costa, 1985b), Costa and Kallick (2008) came up with 16 Habits of Mind. According to them, Habits of Mind help enhance the ways "students produce knowledge rather than how they
merely reproduce it” (Costa, 2008, p. 16). “A Habit of Mind is a pattern of intellectual behaviours that lead to productive actions” (p. 16) and it is a composite of “skills, attitudes, cues, past experiences, and proclivities” (p. 17). There are 6 dimensions which are incorporated in the Habits of Mind (p. 17):

**Value:** Choosing to employ a pattern of intellectual behaviors rather than other, less productive patterns.

**Inclination:** Feeling the tendency to employ a pattern of intellectual behaviors.

**Sensitivity:** Perceiving opportunities for, and appropriateness of, employing the pattern of behaviors.

**Capability:** Possessing the basic skills and capacities to carry through with the behaviors.

**Commitment:** Constantly striving to reflect on and improve performance of the pattern of intellectual behaviours.

**Policy:** Making it a policy to promote and incorporate the patterns of intellectual behaviors into actions, decisions, and resolutions of problematic situations.

These dimensions influence the 16 Habits of Mind presented below.

1. Persisting (Sticking to a task until it is completed)
2. Managing impulsivity (Withholding immediate conclusions)
3. Listening with understanding and empathy (Identifying with others to understand)
4. Thinking flexibly (Adapting mind to situations)
5. Thinking about thinking (metacognition)
6. Striving for accuracy
7. Questioning and posing problems
8. Applying past knowledge to new situations
9. Thinking and communicating with clarity and precision
10. Gathering data through all senses (Observing perpetually)
11. Creating, imagining, innovating
12. Responding with wonderment and awe (Enjoying challenging problems)
13. Taking responsible risks
14. Finding humor (Appreciating humor in human frailty and fallibility)
15. Thinking interdependently (Recognizing the strength of collective thinking)
16. Remaining open to continuous learning
Though the Habits of Mind can be regarded as thinking dispositions, the traits such as finding humor and responding with wonderment and awe are not focused on thinking (Ritchhart, 2002).

In the above sections, we have discussed various frameworks that describe thinking skills and dispositions. Each of the various frameworks has limitations in terms of comprehensiveness. These limitations will be discussed in later sections of this chapter as they form the justification for listing and describing thinking skills and dispositions. But before that, we need to understand the importance of thinking in education and the key debates with regard to teaching thinking.

2.3 Thinking in education

Educating for thinking is not a simple issue. Educators of the 21st century are likely to agree that thinking is one of the most important goals of education. It is seen as an ideal which can and should transform the manner of teaching and the learning of students. Thinking has received far more attention over the past two decades than any other educational objective. Many factors are responsible for its emergence as a fundamental educational aim (see chapter 1). Dewey (1944) emphasizes that “there is not adequate theoretical recognition that all which the school can or need to do for pupils, so far as their minds are concerned (that is, leaving out certain specialized muscular abilities), is to develop their ability to think” (p. 158).

Such philosophers as Paul (1986) strongly hold that the primary goal of education is the development of inquiring minds:

A passionate drive for clarity, accuracy, and fair-mindedness, a fervor for getting to the bottom of things, to the deepest root issues, for listening sympathetically to opposite points of view, a compelling drive to seek out evidence, and intense aversion to contradiction, sloppy thinking, inconsistent application of standards, a devotion to truth as against self-interest—these are essential components of the rational person (p. 1).
2.3.1 Key debates about teaching thinking

It is widely acknowledged that there is a necessity for developing thinking among students. Despite such agreement, there are controversies and questions regarding various aspects of teaching thinking. In this section, we will discuss the arguments against and in favour of teaching thinking.

First, there is a controversy whether thinking is a skill only. Siegel (2010) points out the distinction between possession and performance and dissuades us from considering thinking a unified skill. For example, if a person is able to fly a kite and despite opportunities, does not exercise the skill, it does not indicate a lack of that skill. Because skills are generally associated with procedural knowledge and there is lack of connection between possession and performance. They contrast with qualities of tendencies, which are called dispositions. As a result, there is a danger of neglecting the dispositional side of thinking, which is "continuous with our humanity and constitutive of it" (p. 8).

Another controversy raised is that the exercise of skills generally does not require thinking or understanding. To say that a person has mastered a skill would mean that he/she is able to exercise it with automaticity.

Smith (2002) points out that skills carry two connotations—an acquired ability or capacity, and a special capacity. This distinction can be explained with an example: a child acquires the skill of walking, which is an acquired ability; whereas a skilled driver can do more than just operate motor vehicles. Therefore, thinking skills are special capacities and hence refer to not just normal ability but beyond a basic level of competence.

Ryle’s (1949) knowing how explains that skills are sets of activities that are "schematized or purposively sequenced in varying degrees" (Smith, 2002, p. 661). Though thinking skills are structured mental activities like other skills, they cannot be systematically defined in terms of their procedural components. This is so because there are elements of discretion, judgment, and sensitivity to context, which are at work in exercising them. Therefore, it should be noted that there are some skills which have clear procedural components while in the case of others, rigid proceduralization is not possible given the involvement of dispositional elements.
However, it would be a misconceived notion to conclude that such thinking skills, whose procedural steps cannot be clearly articulated, cannot be taught at all. Perhaps, such misconception might stem up from the belief that knowledge that is still being constructed should not be taken up for teaching. But, as long as the teacher presents such skills explaining their importance and complex nature in reality and suggesting strategies through modeling, there need not be any disagreement.

Second, some educators were skeptical whether thinking skills are amenable to instruction but this “did not proceed from scholarly research, but from an unscholarly assumption that if thinking was not being taught and had not been taught, it therefore could not be taught” (Ruiziero, 1988, p. 3). In spite of this assumption being attacked by several educational philosophers with compelling arguments, they “have never managed to overcome the prevailing ignorance” (p. 3). Many psychologists and philosophers such as A. N. Whitehead, Jean Piaget, John Dewey, Edward Glaser have highlighted the importance of developing thinking abilities. John Dewey (1933) has stated the following in relation to the educational aim: “We state emphatically that, upon its intellectual side education consists in the formation of wide-awake, careful, thorough habits of thinking” (p. 78).

Empirical evidence also suggests that “elements of thinking are clearly teachable” (Resnick, 1987, p. 46). Many thinking programs such as Reuven Feuerstein’s Instrumental Enrichment, Edward de Bono’s CoRT thinking program, Philip Adey and Michael Shayer’s Cognitive Acceleration through Science Education (CASE), Mathew Lipman’s Philosophy for Children have successfully taught skills such as “generating multiple ideas and alternative viewpoints on a particular topic, generating summaries, skimming, figuring out word meanings from context, solving analogies and logical puzzles, and detecting logical reasoning fallacies” (p. 46).

More recently, Marzano (1998) carried out a meta-analysis of 4,000 intervention studies in education, all of which dealt with the teaching of thinking (metacognition) to some extent, have been effective in achieving significant learning gains. His findings strongly support the possibility of teaching thinking skills, which can be observed in what he wrote: “Specifically, instructional techniques that employed the metacognitive system had strong effects whether they were intended to
enhance the knowledge domains, the mental processes within the self-system, or the processes within the metacognitive system itself" (p. 127).

In short, scholars have known that thinking can be taught with an explicit focus on it. Even "those mental talents long considered almost mystical—imaginativeness and originality—can be taught effectively" (Ruggiero, 1988, p. 4). Another offshoot of the above controversy is the argument that teachers do teach students how to think implicitly along with the content.

Third, such sweeping generalization that teaching content in the school subjects automatically develops thinking abilities is counterfactual in view of the existing evidence. With respect to this, Glaser (1941), as cited in Ruggiero (1988, p. 4), referring to a number of research studies on thinking, stated that

In general, the research indicates that if the objective is to develop in pupils an attitude of 'reasonableness' and regard for the weight of evidence and to develop ability to think critically about controversial problems, then the component attitudes and abilities involved in thinking critically about such problems must be set up as definite goals of instruction. (Ruggiero, 1988 p. 4)

Many teachers "confuse telling students what to think with teaching students how to think" (p. 4). Assuming that teaching subject matter well, thinking will result automatically, is sheer folly (Noll, 1935, as cited in Ruggiero, 1988, p. 4).

As for the English language, teachers generally believe that exposing students to great thought and expression will automatically result in the development of student thinking. "Such beliefs suggest a mystical conception of learning, a kind of skill-through-inspiration view akin to the conception of underlying many popular books in the 'self-improvement' genre" (p. 5). While inspiration can definitely raise the motivation levels of students, it is not a sufficient condition for growth in thinking abilities. Just as only watching sports cannot make somebody an athlete, only exposure to inspiring great writings cannot result in effective critical thinking, creative thinking, problem solving, and decision making.

At present, the problem is not more about whether we can teach thinking but how and how best it can be taught. Accordingly, there is a difference of opinion with regard to the way teaching thinking should be carried out. Is it better to teach thinking skills directly or inferentially; through infused or separate programs?
Fourth, with regard to the aspect of how to include thinking into the existing curriculum, two generally known approaches are through infused and separate programmes. Specific thinking skills that are agreed upon by the stakeholders can be infused into each subject area of the curriculum, which is called “infusion” approach to the teaching of thinking skills. Some researchers support such infusion in each subject domain in the curriculum. Bransford, Burns, Deelos, and Vye, (1986) observe that “blind instruction does not usually lead to transfer to new tasks...as the instruction focuses on helping students become problem solvers who learn to recognize and monitor their approaches to particular tasks [italics added], transfer is more likely to occur” (pp. 69-70). Gough (1991) also endorses the same notion: “thinking skills should be deeply embedded in the whole fabric of an instructional program” (p. 4).

Another set of researchers such as Matthews (1989) and Pogrow (1988) provide support for separate thinking skills instruction. However, the support for these two approaches suggests that either of the approaches can be effective.

About the second question, whether thinking should be taught explicitly or inferentially, in inferential approaches, the students are provided with opportunities to engage in the required cognitive processes but the students are not informed about the cognitive processes or operations involved in the activities. The HOTS (Higher-Order Thinking Skills) program developed by Stanley Pogrow (1988) falls into the category of inferential approaches. In addition to this independent program, several other strategies such as cooperative learning, reciprocal teaching, and Socratic dialogue are also examples of this approach. One of the disadvantages of this approach is that awareness and control over the thinking processes that the teachers as well as the students have are minimal.

In the case of the explicit approach to teaching thinking, teachers deliberately focus on the key attributes of the cognitive operations and develop tasks to realize these cognitive operations (Beyer, 1987). Further, the students are informed about the skill that they are going to learn. Programs like Instrumental Enrichment, Cognitive Research Trust (CoRT), and explicit instruction model developed by Barry K Beyer are examples of this approach. While these programs have also been widely successful, it is argued that teaching individual parts need not make a whole. This
means that focusing on individual skills may increase awareness as to the procedural components of the cognitive operations but there is no guarantee that the mastery of these discrete skills may result in their integrated use in a real-life context.

It follows from the above that both the approaches have their own advantages and disadvantages, it is suggestible that a blend of the two may well be the most effective choice, as pointed out by Pearson (1982): "I think the justification exists for placing more emphasis on direct explicit teaching, interactive discussions, substantive feedback, and control and self-monitoring strategies" (p. 23).

In brief, both the infusion or separate programs are not inherently superior to each other; both can improve thinking abilities of students. Similarly, evidence suggests that both direct teaching and inferential learning have been successful. Depending on the objectives that have been set, it is at the discretion of the program designers to choose between the approaches.

In the above section, we have examined a few research studies that attempted to persuade educators that thinking can be taught. In the following, a summary of the research studies that aimed at various aspects of teaching thinking will be reviewed.

2.4 Research on teaching thinking

Though a considerable amount of research carried out in the field of thinking skills, much of it is not accessible to the teachers of English and many of the authors we are going to look at don't figure in the ELT literature. One of the reasons could be considering teaching thinking as unrelated to ELT but as related to other subject domains. Arriving at such conclusions could be justified because of the large amount of evidence for teaching thinking is from other subject domains. Though language and thought are inextricably linked, only a few research studies in teaching thinking can be found in the literature related to language teaching. In what follows, we will have an overview of the research studies on the effectiveness of various aspects of teaching thinking.

2.4.1 Teaching thinking is important

Sternberg and Bhana (1986) reviewed a large number of evaluation studies on the most widely used thinking skills programs: Instrumental Enrichment, Philosophy
for Children, SOI (Structure of Intellect), Problem solving and Comprehension, and Odyssey (a program for developing creative thinking skills through team problem solving and brainstorming). The review made them conclude:

The opportunities exist to increase students' thinking skills, and the time to seize them is now. What is needed to make such instruction succeed is cautious planning, a sound program, effective implementation, strong commitment, and diligent evaluation. When these ingredients are present, instruction in thinking skills is both possible and feasible. (Sternberg & Bhana, 1986, p. 67)

Nickerson (1989), after reviewing many aspects of thinking programmes, asserted that "[m]any of the approaches to the teaching of specific aspects of thinking that have ... much promise and are worthy of further research and development" and reminds us that "we know that at least some aspects of teaching thinking can be improved through instruction now and that certain approaches can have demonstrably beneficial effects" (p. 44).

It can be concluded that while some of these programs have flaws, any program, when grounded in sound theoretical principles and taught systematically, can be effective in developing thinking skills.

2.4.2 Teaching thinking skills for transfer

Transfer is essential to our expectations and aspirations of education. We teach students to read *To Sir, with Love* or other reading material not just for the sake of reading only those specific ones but to develop the skills to read a wide variety of texts. When skills transfer is achieved along with knowledge transfer, the fundamental goal of education is reached.

Many researchers have pointed out that students rarely *transfer* thinking skills without assistance to other situations (Nickerson, 1989; Perkins & Salomon, 1989;). The pedagogy of thinking, which includes critical thinking, is viewed as a potential solution to transfer problem (Avery, 1994; Perkins & Salomon, 1989). Accomplishing this task is possible with extensive follow up practice after the instruction in thinking skills. Researchers and experts have also suggested that by helping students to generalize from the circumstances of the learning material and teaching how to apply
the principles to other contexts, transfer can take place (Borkowsky & Krause, 1985). Other research studies also explain that instruction where application of thinking skills in a new context can enable learners to generalize the skill beyond the context in which it was taught initially (Rosenshine, 1997; Nickerson, 1989).

Perkins and Salomon (1988) suggest ways to low and high road transfer through **hugging** (application of skills in real life contexts) and **bridging** (abstraction of skills learnt in a subject or context are transferred to other subjects or contexts).

“[T]eachers can point out explicitly the more general principles behind particular skills or knowledge will sound familiar. Teachers already pose questions and organize activities of these sorts from time to time. However, rarely is this done persistently and systematically enough to saturate the context of education with attention to transfer. On the contrary, the occasional bridging question or reading carefully chosen to “hug” a transfer target gets lost amid the overwhelming emphasis on subject matter-specific, topic-specific, fact-based questions and activities” (p. 29).

2.4.3 **Teaching specific thinking skills**

Researchers in the field of thinking and cognitive skills have found that there are a few basic skills such as comparing, classifying, sequencing, and prediction (Paris, Wixson, and Palincsar, 1986). Mastering these skills is so important that they influence learner autonomy and achievement in reading comprehension (Siegler, 1998).

Systematic instruction in the explicit teaching of thinking operation or skills can increase their thinking abilities (Whimbey, 1980). Frederiksen (1984) explains that

There is some disagreement as to whether problem-solving processes should be taught explicitly or by allowing the learner to discover them. The former method would surely be more efficient in bringing students to the point where they can cope successfully with a specific kind of problem, while the discovery method would be more likely to lead to the ability to generalize the acquired procedures to problems that do not closely fit the problem type being taught. (p. 397).

Such direct instruction can accelerate skill improvement introducing them to effective thinking procedures by providing continual, productive and guided practice of skills.
autonomously (Duffy, et al., 1987). While this approach is helpful in introducing complex skills to students of any ability level (Frederiksen, 1984), it appears to benefit and appeal especially to low-achievers (Peterson, 1979).

Once the thinking skills are introduced explicitly, persistent practice over an extended period is highly essential for the development of autonomous proficiency (Frederiksen, 1984). Anderson (1982) avers that “[i]t requires at least 100 hours of learning and practice to acquire any significant cognitive skill to a reasonable degree of proficiency” (p. 369). Such practice needs to be guided by the teacher since at this stage, students’ performance is halting, often laborious, and fragmented (Beyer, 2008; Frederiksen, 1984). Scaffolding thinking skills practice using several tools such as graphic organizers, procedural checklists, etc, to lead students through procedural steps in applying the skill allows students to concentrate on performing the key steps with greater precision (Rosenshine & Meister, 1992).

Further, cues for thinking skills include using the skill name or synonyms which were taught previously, directions and explanations, stating the first several steps in skill procedure (Rosenshine & Meister, 1992).

In later stages of thinking skill instruction, instructional support needs to be decreased as the students’ proficiency becomes rapid, smooth, and autonomous (Anderson, 1982).

### 2.4.4 Metacognition

Researchers agree that making the procedures and components of skills explicit and visible is essential in teaching thinking skills (Rosenshine & Meister, 1992; Sternberg, 1984). *Metacognitive reflection* is a useful technique for making thinking explicit. “Repeated use of metacognitive reflection during initial efforts to apply a new skill enables novices to identify flaws in their own thinking as well as recognize and gradually construct or reconstruct more effective procedures for applying the skill” (Beyer, 2008, p. 226).

Think aloud can also be used as a tool or strategy for developing thinking skills. While it has been a research tool for making thinking explicit or visible, it can
also be useful in instructional settings. This tool has been used extensively to identify the cognitive processes of experts and novices in problem solving, comprehension, etc (Whimbey & Lochhead, 1999).

As mentioned earlier, Marzano (1998) carried out a meta-analysis of 4,000 intervention studies in education. His findings strongly support the possibility of teaching thinking skills, which can be observed in what he wrote: “Specifically, instructional techniques that employed the metacognitive system had strong effects whether they were intended to enhance the knowledge domains, the mental processes within the self-system, or the processes within the metacognitive system itself” (p. 127).

Metacognition is generally defined as involving knowledge about, the monitoring of, and the control of that process. These aspects of metacognition can improve performance of thinking skills, including students’ learning (Winne, 1995). For this reason, many researchers have sought to train students to engage in metacognitive thinking to improve their learning (e.g., White & Frederiksen, 1998).

2.5 Programs for teaching thinking

The idea of teaching thinking has received criticism from several quarters, philosophers and psychologists equally. Nevertheless, those controversies, arguments, and questions could not discourage or prevent the teachers in attempting to develop thinking abilities among students. Well-informed and seasoned teachers developed various programs for teaching thinking.

In this section, a brief review of those programs will be presented. These programmes are classified under two categories: Teaching thinking within a specific subject (See 2.5.1) and teaching general thinking skills (See 2.5.2).

2.5.1 Teaching thinking within a subject context

This section will focus on the nature of the thinking programmes developed within a specific subject domain. An outline of the aims, design, content and methodology of the programmes will be presented.
2.5.1.1 Philosophy for Children

Matthew Lipman is the originator of the programme, Philosophy for Children. With his co-authors, Lipman designed the programme to facilitate the creation of communities of enquiry. The aim of the programme is “to promote excellent thinking that is creative as well as critical, imaginative as well as logical, inventive as well as analytical” (Lipman, 1985, p. 212). Guiding the students through philosophical discussions, they are encouraged to think by “interpreting, exploring ideas, proposing ideas, agreeing and disagreeing and posing questions, all to develop an ‘ethical consciousness’” (McGregor, 2007, p. 94).

The programme was introduced to middle school children in the UK and delivered through English or Social Studies. It involves reading particular novels that provide children with a wide range of situations that challenge them to practice their reasoning and inquiry skills. The novels contain dilemmas of rationality, ethics, morals, aesthetics, science reasoning and civic values. The dilemmas are designed to reflect the lives of the children who participated in the programme. Regardless of the grade level, Philosophy for Children is generally taught about two and one quarter hours weekly for an entire year. It is not unusual for each program to extend over two years since much class time must be devoted to discussions and exercises” (Lipman, 1985, p. 213).

The characters in the novels discuss a wide variety of ideas underlying which philosophical questions are incorporated. Through the questions raised on the stimulus in the discussion between children, the underlying reasoning is externalized so that it can be observed by the users as well as the others. Hence, metacognitive thinking is an inherent part of the programme. The programme has been successful in enhancing the reasoning proficiency of the subjects in various experiments such as the longitudinal study conducted by the Educational Testing Services, USA. (Lipman, 1985).
2.5.1.2 Cognitive Acceleration through science education

The Cognitive Acceleration approach was initially developed within science subjects in the 1980s and later was introduced into other subject areas such as mathematics, technology, etc. Funded by British Economic and Social Research Council, Cognitive Acceleration through Science Education (CASE) project was directed by Michael Shayer with the full-time researchers Philip Adey and Carolyn Yates. The programme is designed based on the learning theories of Jean Piaget and Lev Vygotsky (Adey & Shayer, 1994). The aim is to improve intellectual performance through improving student’s cognitive processing ability. The CASE project materials were designed to address “each of the schemata of the formal operations and incorporate the principles of concrete operation, cognitive conflict, construction zone activity, metacognition, and bridging into a set of activities whose context was overtly scientific” (p. 79). Aimed to accelerate the rate at which students, aged 11 to 14 years, develop more abstract levels of thinking, Cognitive Acceleration intervention programme is generally conducted for a two-year period with the following phases: concrete preparation, cognitive conflict, construction, metacognition, and bridging.

The programme has also inspired teaching thinking in other subject domains resulting in Cognitive Acceleration in Mathematic Education (CAME), and Cognitive Acceleration in Technology Education (CATE).

2.5.1.3 Swartz and Parks' infusion of thinking

Swartz (2001b) states that instruction for a short period, which aims at developing thinking might not develop much automaticity. Contrastingly, he describes the infusion of teaching of thinking into content instruction. Infusion approach combines subject content with skilful thinking which can be used in everyday life to make effective decisions and solve problems skillfully. This approach has three basic guiding principles:
• The more explicit the teaching of thinking is, the greater the impact it will have on students.

• The more the classroom ethos promotes an atmosphere of thoughtfulness (reflection), the more open students will be to value good thinking.

• The more the teaching of thinking is integrated into content instruction, the more students will think about what they are learning. (Rockett & Percival, 2002, p. 27)

Promoting thoughtful content with varied instructional methods include guided reading, asking higher order thinking questions, writing frames for reflection, scaffolded essay writing, cognitive mapping, and Socratic dialogue.

In this approach, the sequence and progression of the skill improvement is not prescribed for the teachers, rather, they are encouraged to incorporate thinking into the curriculum as they proceed through a specific unit of study.

The lessons are taught using a four-step strategy: First, the students are introduced to the thinking abilities by demonstrating its importance. Second, they are guided with explicit prompts to engage in thinking while they learn about the content in a specific subject area. Third, they are asked reflective questions, the intention of which is to let the students shift from what they think to how they think. Fourth, the students are provided with additional opportunities to engage in higher level thinking.

The use of graphic organizers is a key element in the infusion approach since they focus and clarify the thinking steps to reach a solution. List of questions to help the teachers to ask are also provided. These questions would function as scaffolds for the students to respond in a systematic, organized and detailed way.

Cooperative and collaborative learning are strongly suggested. Teachers are expected to facilitate thinking, group interaction and class discussion besides modeling good thinking. Questioning is a key strategy that is suggested to be used throughout.

In the above section, we have seen the programmes that aimed at teaching thinking skills within a subject context. In the following, we will discuss the programmes that focused on teaching general thinking skills.
2.5.2 Teaching general thinking skills

There have been programmes that aim at teaching general thinking skills. In these programmes, more emphasis is laid on explicitness of thinking skills. They assume that there are general thinking skills which are common across various subjects and domains of knowledge. Three popular programmes—Instrumental Enrichment, Somerset Thinking Skills, and CORT Programme—are reviewed. These prominent programmes focused on teaching general thinking skills without infusing into any subject context.

2.5.2.1 Instrumental Enrichment

Reuven Feuerstein, who was the student of Jean Piaget, was an Israeli clinical psychologist. He believes that learning occurs in a social context through social interactions. A key notion in Feuerstein theory is his belief that cognition is modifiable. That is, anyone, irrespective of their age and background, “can fully become an effective learner” (Williams, 1998, p. 88) and in the process of development the very structure of the cognition is altered in a fundamental way, which he calls “structural cognitive modifiability”.

Feuerstein’s Instrumental Enrichment (IE) is a cognitive intervention programme aimed at teaching students to think and solve problems with an assumption at its core: “cognitive development requires direct intervention over time to build the mental processes for learning to learn” (Link, 1985, p. 195). It is a “strategy for the redevelopment of cognitive structure in retarded people... The Instrumental Enrichment program is addressed not to pay any specific skill or content area but to the process of learning itself” (Feuerstein, Rand, Hoffman, & Miller 1980, p. 1).

The intervention programme aimed at children who remained underdeveloped in spite of normal mainstream schooling. The programme is a package that contains about 400 cognitive tasks and exercises grouped in 14 areas of cognitive functioning called “instruments” (Link, 1985, p. 193), which are as follows:

- Organization of Dots (finding the relationship among a field of dots).
- Orientation in Space I (differentiating visual frames of reference);
Comparison (discriminating similarities and differences);
Analytic Perception (analyzing component parts and their interrelatedness);
Categorization (creating conceptual categories);
Instructions (using language as a coding system for information and processes);
Temporal Relations (isolating time, distance, & velocity);
Numerical Progressions (perceiving principles manifested in numerical patterns);
Family Relations (understanding individual roles in hierarchical organization);
Illustrations (defining and analyzing the reasons behind a problem);
Transitive Relations and Syllogisms (drawing inferences, critiquing premises);
Representational Stencil Design (analyzing and recreating a picture);
Orientation in Space III (understanding relative positions from personal orientation)

These written tasks are done with mediation by the teacher. The mediation is founded on two basic principles—intentionality and reciprocity. That is, the teacher explicitly expresses the intention of mediation and the child is expected to reciprocate. Through this mediated learning, as many as 60 cognitive functions can be developed among children. These cognitive functions can be put under the following sub-heads (Moseley, et al., 2005, p. 57): control of perception and attention; comparison; categorization; understanding relationships; defining problems; thinking hypothetically; planning; and solving problems.

Feuerstein believes that it is possible to teach generalizable cognitive skills using decontextualised materials. Nevertheless, heavy reliance on visual stimuli in materials, which is the case of this program, rather than collective learning and collaborative dialogue may restrict opportunities for learning.

2.5.2.2 Somerset thinking skills

By the mid-1980s, when Instrumental Enrichment failed to make a major impact in the UK, a research was carried out in Somerset in the late 1980s, which culminated in Somerset Thinking Skills Course. Using some of the underlying principles of Instrumental Enrichment and, Nigel Blagg developed a theoretical
framework of Somerset Thinking Skills course, which was also influenced by
information processing analyses of intelligence and problem solving approaches.

The course is offered to students aged 10 to 16 years with the objective of
encouraging them to develop the skills to become proactive learners within any
problem solving situation. “Participation in the programme supports transformation
from a passive recipient of information to an active searcher and generator of ideas,

Teaching is done through mediation which according to Neil Blagg is an art
since it is a dynamic and interactive process between the teacher and pupils. The
modules in the programme are designed to be progressive and used in an ordered
sequence. There is a range of open and closed tasks and many of them welcome
divergent answers. The sequence of the modules that constitutes, the Somerset
Thinking Skills course is (p. 107-110):

1. Foundations in problem solving
2. Analyzing and synthesizing
3. Comparative thinking
4. Positions in time and space
5. Understanding Analogies
6. Patterns in time and space
7. Organizing and memorizing

Similar to Instrumental Enrichment, visually stimulating materials are used as the
springboard for the lessons. Within each module three different types of tasks are
there: stimulus activities; artificial tasks; naturalistic tasks. Though many schools
have adopted the Somerset Course, “it has not enjoyed huge success overall. Some
feel that this is caused by the very structure of curriculum in England, which puts so
much stress on the separate subject disciplines.....at the expense of a sufficient focus
on learning skills” (Rockett & Percival, 2002. p. 22).

2.5.2.3 The CoRT thinking programme

Edward de Bono’s CoRT (Cognitive Research Trust) programme primarily
focuses on generative or productive thinking. He asserts that critical thinking or
scholarly thinking, though significant, "can never be the whole of thinking" (de Bono, 1976, p.16). Hence, in this complex technical world, "generative, creative, and constructive" thinking is highly essential and though "generative thinking is messy, imperfect, and impure and perhaps difficult to teach", "it is important that we should teach it" (p. 16).

In the practical world, as de Bono argues, "very few errors are logical errors" (p. 66), which have been the focus and the main part of our thinking, most of our thinking errors are due to inadequacy of perception for which he suggests that we should teach for better perception.

The CoRT (Cognitive Research Trust) programme is a systematic framework for teaching thinking through 60 lessons which are intended to be used with students aged more than 9 years. However, CoRT programme has also been used in corporate training. The materials provide a detailed set of teachers’ notes and pupil activities. The content of the programme is organized into 6 blocks—Breadth, Organization, Interaction, Creativity, Information and Feeling, Action, as follows (Adey & Shayer, 1994):

- **PMI**: Plus, Minus, Interesting points (Looking for positive, negative, and interesting aspects in a situation)
- **CAF**: Consider All Factors (exploring a situation before closing in a possible solution)
- **Rules**: Practice PMI and CAF
- **C&S**: Consequence and Sequel (exploring the consequences of a decision)
- **AGO**: Aims, Goals, and Objectives (investigating the purposes of an action)
- **Planning**: Practice C&S and AGO and reinforce PMI and CAF
- **FIP**: First Important Priorities (directing attention to first important priorities after the generation of ideas)
- **APC**: Alternatives, Possibilities and Choices (developing alternatives, possibilities and combinations)
- **Decisions**: Practice FIP and APC
- **OPV**: Other People’s view (directing attention to other points of view to provide a balance between one’s own point of view and that of others)
De Bono lists four levels of achievement in the acquisition of thinking skills through the use of the CoRT programme (de Bono, 1983).

Level 1: General awareness of thinking as a skill. Willingness to think, explore, and listen to others.

Level 2: A more structured approach to thinking through looking at the consequences of an action, searching for alternatives, etc.

Level 3: Deliberate use of CoRT tools. The organization of thinking as a series of steps. A sense of purpose in thinking.

Level 4: Fluent and appropriate use of CoRT tools.

An important aspect of de Bono's CoRT program is that, as he claims, the thinking tools are content-free thinking skills and can be taught as a separate programme without infusing or embedding them into a content area. But McPeck (1981) argues that thinking is always about something and the subject of thought defines the nature of thinking. Besides, he argues that any thinking skills that are general are only trivial and are less useful. With regard to this, Gardner (1993) supports the idea that there are valuable general thinking skills but he suggests that these general thinking skills should be explicitly taught in specific subject areas.

2.6 Strategies for teaching thinking

While the programs for teaching thinking are macro-level plans, strategies are the micro-plans, which are helpful in the success of the thinking programs. In this section, we shall discuss a few strategies that have been used by experts successfully in promoting thinking abilities among students of various age groups. A strategy, as seen here, refers to *the conscious use of a plan of action to achieve a goal*, and it is associated with procedural knowledge. Strategic teaching can have better results, in fact, Fragenheim (2005) opines that

"I do not believe it is particularly fair to expect students to analyse, hypothesise and be creative and evaluate if I do not offer them a strategy to do so. Offering students a **PCQ** or **Y Chart** will help them analyse (discuss or
think about) far more successfully than simply relying on their innate ability or
at worse, relying on the strategy of osmosis to bring success” (p. 5).

Fragenheim suggests here the importance of mediation and potential
development that could take place by the intervention of the teacher.

In what follows, we shall look at a few strategies for teaching thinking.
Whereas there are a number of strategies in this regard, the strategies presented here
have a clear language link. All these are well established strategies in the education
field and they have shared meanings. However, in the following accounts, alternative
ways of using the strategies are presented in addition to their well established patterns
of application. Such alternative ways, which are based on the researcher’s study, are
articulated to emphasize teaching thinking and to put them into practice to document
their effectiveness.

2.6.1 Analogy

Analogy forms a central component in human cognition and pervades every
domain of human thought. Analogies can be witnessed in religious scriptures and the
writings of poets and philosophers across generations in different cultures, for which
language has been the tool that has greatest potential, among other representation
systems—figural, numeral, etc. The instrumental role of analogy in thinking
manifests itself in many different cerebral offerings (Gentner, Holyoak, & Kokinov,
2001): translation, scientific reasoning, political debate, creative design, humour,
empathy, decision-making, problem-solving, memory recall, and infant imitation.
Though it is not the only basis for thought, “diverse manifestations of analogy support
the claim that it forms a critical part of the core of cognition” (p. 7). In cognitive
science, the study of analogy began in intelligence tests and other psychological
experiments and interventions, focusing on four-term analogy problems of the kind
derived from Aristotle: who defined analogy as “an equality of
proportions......involving at least 4 terms......when the second is related to the first as the
fourth is to the third” (Gošvami, 1992, p. 4). Typically, these four term analogies take
the form of A:B::C:D (e.g., cat is to kitten as dog is to what?)
Steps in Strategy Use

Studying and creating analogies help students develop comprehension of vocabulary and concepts as they improve their reasoning ability and their critical and creative thinking skills. Teaching vocabulary through analogies is one of the popular teaching strategies. Here, the end is to build word knowledge.

However, in order to develop the thinking skills of the students,

i) Teachers can introduce the common types of relationships by using examples. This awareness raising can be at word-level.

ii) They can encourage the students to observe similar relationships between two sentences (teaching structural patterns), two paragraphs and passages (teaching rhetorical organization and various elements), two visual/graphic stimuli (teaching non-verbal communication).

iii) Using the above as a springboard, the relationships thus discussed can be used to establish connection between two real-life problems, situations that demand decision-making, etc.

Instructional benefits

This strategy

• develops understanding of the nature of various kinds of relationships;
• helps students identify and analyze relationships among elements, aspects, etc;
• develops and refines students' understanding of the specific vocabulary and concepts that are used in analogies.

2.6.2 Brainstorming

The term Brainstorming was introduced by Alex Faickney Osborn in his 1953 book Applied Imagination. According to him, it is a method by which a group tries to find a solution for a specific problem by amassing a list of ideas spontaneously contributed by its members. The rule of brainstorming is to think of many and different ideas, and to suspend judgment until students generate ideas to their maximal level. Brainstorming can open students' minds so that they can think of ideas that might not normally have occurred to them. Not all of the ideas they generate may be
equally useful, but in thinking of many different ideas, they may discover some valuable insights among the less important ones.

A variation of Brainstorming is called Paired Brainstorming. Using this strategy, students may be asked to individually list ideas about a topic. Then, after a few minutes, ask them to form pairs, share their ideas with each other, and then keep adding to the list. Later, the pairs of students are asked to share their ideas with the whole group, as the teacher writes them on the board.

Another variant proposed by Kagan (1992) is Carousel Brainstorming. In this strategy, students work in teams to brainstorm ideas at a home station (a place in the classroom where a group of people begin to do an activity and move on to other places (stations)), writing them on a large sheet of paper. Then the teams move from station to station, adding their ideas to those of the other groups. When the teams return to their home station, they read the ideas that have been added to their paper, raise questions about that new information, and add ideas they may have obtained from other groups. This strategy incorporates reading, writing, speaking, and listening in a natural way.

Generally, brainstorming strategy in a language learning context precedes some main activity, more frequently writing. Here, it is seen as a means to achieve another language objective. An assumption that is taken for granted is the ability of the students to generate ideas. In the above strategies developed by various experts, it seems to have been thought that students do generate ideas with considerable fluidity. Moreover, it is also assumed, in such contexts, that children are not only writing that they are thinking effectively. But in reality, it might not be the case. Unless teachers explain various strategies to generate ideas considering brainstorming as an objective, they cannot ensure themselves of the thinking activity of children.

Teachers may take up "generating ideas" as a distinct skill and use strategies to develop the skill among students. Instead of viewing brainstorming only as a precedent to some main activity, tasks may be designed to realize only this skill.
Steps in Strategy Use

- A collection of various task types where brainstorming is generally used may be made. For instance, brainstorming is used in writing an essay, timed group discussion, one-minute speeches, problem-solving and decision-making tasks, etc.

- Using various strategies, teachers may concentrate only on generation of ideas across various tasks types.

- They may stop with generation of ideas followed by evaluation of each idea and narrowing down to the extent needed, which is determined by the task type chosen for the purpose. Say, for a task type such as writing an essay on preferring living in rural or urban areas, brainstorming, be it individual, paired, or carousel, is done and ideas are generated. Each of the ideas thus generated may be evaluated for the purpose of writing the essay. As a result, the ideas which are not relevant may be discarded and decision must be made on the final list of the ideas to be considered for writing that essay.

- The activity stops here without progressing into writing of the essay. This is followed by another type such as one-minute speeches, etc., and the above steps are repeated.

- In addition to generation of ideas, the students may also be asked to generate as many questions as possible. This can work in the case of problem-solving and decision-making task type.

Instructional benefits

This strategy

- encourages students to think about what they know;
- activates their prior knowledge;
- reinforces learning by having students restate ideas orally and in writing;
- gives students opportunities to listen to and understand each other's ideas;
- leads students to generate questions about what they have learned.
2.6.3 Directed Reading-Thinking activity

Directed Reading-Thinking Activity (Stauffer, 1969) is a strategy for guiding readers through a text. The processes in this strategy encourage students to be active and thoughtful readers, improving their comprehension abilities. The students repeatedly predict about what they will read next and then confirm or refute their hypotheses by reading. This approach develops critical thinking skills and builds vocabulary, comprehension, and reading fluency.

In this strategy, the teacher asks students to hypothesize before they read each part of the text, inviting them to use their own previous knowledge and clues in the text to predict successive events. This focus on prediction in the DRTA raises the level of thinking about the text and engages students in critical evaluation of their hypotheses in the light of the available evidence.

Another variant of this strategy is Directed Listening-Thinking Activity, which is used in building the knowledge phase of a lesson, the part of a lesson in which students are inquiring to make meaning. In this activity, students listen to a story that is told or read to them and make predictions about what will come next. They are asked to confirm their predictions from time to time with information from the text, and to make new predictions.

Steps in Strategy Use

- The teacher selects the text to be used and selects points beforehand to pause during the reading process.
- The teacher introduces the text, the purpose of DRTA, and provides examples of how to make predictions.
- At the stopping points, the teacher asks questions such as “What do you think will happen next?” “Why do you think so?” “Do you all agree? Why? Why not?”
- After a few minutes of discussion, the teacher tells students to read to get more information followed by announcing of the next stopping point.
Then, the teacher asks students if they have found information relating to any of their predictions and have them discuss the information and read aloud from the text to support their assertions.

Then, repeat the cycle of predict, read, discuss, predict, read, discuss until the group has finished the story.

**Instructional Benefits**

This strategy

1) encourages students to be active and thoughtful readers;
2) activates students' prior knowledge;
3) teaches students to monitor their understanding of the text as they're reading;
4) helps strengthen reading and critical thinking skills.

### 2.6.4 Frayer Model of Concept Development

Frayer's (1969) model of concept development helps students build thorough understanding of a concept. The process involves contrasting examples of the concept with non-examples, determining essential and non-essential characteristics, and organizing the information into a template/chart/box (See fig. 2.2).

![Frayer Model](image)

**Fig. 2.2 Frayer model of concept development**

While this model, which is represented in the form of a chart box that contains four squares, is frequently used in content subject areas such as physics, mathematics, and biological sciences. In English language teaching, this is usually used as a word categorization activity that helps learners develop their understanding of vocabulary.
The teacher assigns a concept or vocabulary word and the students provide a definition, list characteristics or facts, and provide examples and nonexamples of the concept. The accompanying discussion and debate stimulate high level thinking, while the structuring of the ideas in writing aids comprehension and retention.

Steps in Strategy Use

- The teacher explains the purpose of the strategy to the students.
- The teacher hands over a chart, where the target concept is written in the middle of the chart. The students work both in small groups and as a whole class to think of examples and non-examples, essential characteristics and non-essential characteristics.
- They may discuss the four categories of information in any order and may add, delete, or revise information in any category at any time.
- This may be extended by asking students to write a definition using the information in the chart.

Another variation of Frayer Model could be leaving the concept area of the chart blank and having students figure out, from the information in the chart, what the concept is. This use of the chart gives students practice in inductive thinking while also developing their knowledge of the target concepts.

Instructional benefits

This strategy

- develops, refines, and extends the understanding of concept or vocabulary;
- elicits and improves the analysis of attributes of a concept;
- develops skill in systematic organizing of information;
- develops the skills of defining concepts.

2.6.5 Freewriting

The term Freewriting was coined by Elbow (1981). It is a strategy that involves writing steadily without stopping and worrying about mechanics for a specific period of time, for instance, for 3 to 5 minutes. It helps students collect their
thoughts, explore associations with anc reactions to a topic, formulate ideas, and improve their writing fluency. It is generally used as a prewriting strategy, and may also be used in learning logs and journals so as to know the levels of students’ knowledge. Two kinds of freewriting are used: focused and unfocused. Freewriting about a character in the story (novel) that is currently being read by the teacher and students can be an example of focused type. Unfocused Freewriting may be used subsequent to an activity where the students may tend to reflect. Whereas the teacher does not ask the students to focus on specific concept or aspect, it is possible that the students may jot down what is there in their minds.

Steps in Strategy Use

- The students write for 3 to 5 minutes.
- They go steadily and don’t stop writing.
- They do not look back, cross out, think of the correct spelling, etc. Their only objective is to scribble their thoughts on paper.
- This is continued till the predetermined time ends.

Since the value of freewriting lies in the process, it might not be necessary to grade its products. Students may be encouraged to keep their freewritings, and use them for later reflection or glean from them ideas for more formal writing that they do for specific audiences and other purposes.

Instructional benefits

This strategy

- helps in the generation of ideas;
- provides an opportunity to formulate ideas;
- increases ideational fluency;
- increases students’ writing fluency.

2.6.6 Graphic organizers

Graphic organizers are helpful in arranging information so that the relationships among the concepts are made clear visually. For gifted learners, it might be easier to process if the information is arranged in linear fashion whereas some
learners process information with relative ease when it is organized in visual representations. Such representations are called graphic organizers. There are many different types of graphic organizers. Displaying information in graphic form was supposed to have been first developed by John Venn in the 1880s. Venn diagrams have been used in mathematics to show the relationship between elements in a set. Now, they are used in virtually every area in the curriculum to illustrate similarities and differences between two or more people, ideas, or items. A T-chart is used to organize information about two topics or main ideas. A flowchart with boxes and arrows, commonly seen in the business world to present a plan of action, can be used in the classroom to organize information into chronological order, either from left to right or from top to bottom, while boxes and arrows can also be used to show specific cause-effect relationships. Hyerle (1996) provides many examples of effective uses of such learning aids and argues persuasively for the use of visual tools that are linked to specific thinking processes. Marzano, Pickering, and Pollock (2001) articulate the value of letting students make non-linguistic representations of what they have learned in order to deepen their understanding.

Steps in Strategy Use

- The teacher shows students how to organize ideas in a graphic organizer. The teacher selects appropriate visual tools to suit the classroom activity.
- The teacher may model for students how to use the information in the organizer for an appropriate learning purpose.
- After constructing some graphic organizers with students and showing them how to use the completed organizer for a specific purpose, the teacher puts them in small groups, and give each group a blank organizer.
- Students may practice constructing their own graphic organizers in small groups to accomplish specific learning purposes.

Typically, these are used as tools in aiding learning. However, when the focus is teaching thinking, organization of information may be taught as a distinct skill. For
the purposes of imparting the skill, materials may be developed to let students identify relationships between various elements in the information provided to them.

2.6.7 I-Search reporting

I-Search Reporting was designed by Kan Macrorie as an alternative to reports based on print-based sources of information. This strategy has been popular with titles such as I-Search paper, -Search procedure, and I-Search project. It is an effective way for students to practise multiple skills such as listening, reading, and writing and at the same time find answers to real life problems and questions.

Macrorie (1988), as cited in Marzano (2004), uses the phrase I-Search instead of research and emphasizes that in re-search, the job is to search again what someone has already searched whereas in I-search, students do original research to fulfill a need, “not that the teacher has imagined for them but one they feel themselves” (p. 14).

I-Search process, in its basic form, “involves students’ gathering of information about a topic of great interest to them, synthesizing and organizing this information, and then using it to write a paper that follows the established conventions of writing” (Marzano, 2004, p. 46).

Steps in Strategy Use

- The students formulate questions about a topic that interests them.
- The teacher helps them narrowing down the broad ideas and adds related questions that will enhance their learning.
- The students work in pairs or groups to make a list of possible sources of information. The teacher provides suggestions reminding them that the best sources include people who know about their topic, organizations that can be visited or reached by phone, television or radio programs.
- Importantly, the teacher encourages students to use non-print sources as much as possible so that they will learn that research involves more than looking things up in encyclopedias or on the internet.
• The teacher allows time for students to gather information and take notes over the course of several days.
• The students, after collecting the necessary information, write their drafts in first person. Conversational tone is suggested in such writing.
• The students meet in small groups to help each other revise their drafts to improve clarity of expression, word choice, grammar, etc.
• The students may publish their I-Search reports by posting them around the classroom, notice board, etc.

**Instructional benefits**

This strategy
- develops research and reporting skills;
- stimulates interest in original expository writing;
- develops thinking skills such as evaluation of information.

### 2.6.8 KWL strategy

KWL is a three-step procedure where three basic cognitive steps are required by students (Ogle, 1986): identifying what they Know, determining what they Want to learn, and recalling what they did Learn. This strategy is used to guide students in their learning of subject matter, especially in elementary classrooms, and thus is best used with expository texts. Learning theories inform us that active learning is better than passive learning. Students learn best when they remember what they already know, ask questions, confirm their new knowledge. This activity includes all the three.

**Steps in Strategy Use**

- The teacher begins by naming the topic, asking students to think of what they already know about it.
- The teacher creates a K-W-L chart on the black board.
- The students are asked to call out what they know about the topic. Their ideas are written in the column marked "What do we Know?"
• The teacher asks the students to think of questions they have about the topic. They may begin by reviewing what they know, and finding areas where their knowledge is incomplete. The teacher writes their questions on the chart in the column marked ‘What do we Want to Know?’ The teacher may also add some of his/her own questions.

• The students should now read the text. They are reminded to look for answers to their questions, and for any new ideas they did not anticipate.

• The students report the things they learned from the text. First, they report answers they found to their questions, and then they report any other interesting or important ideas they discovered. The teacher now posts these on the chart in the column labelled “What did we Learn?”

**Instructional benefits**

The strategy

• encourages students to think about the resources and strategies for gathering information;

• develops metacognitive awareness of their knowledge and thinking;

• develops reading with clear purpose;

• develops comprehension of the material.

**2.6.9 List Group Label**

This strategy was developed by Hilda Taba in 1967 to stimulate inductive thinking. She drew significantly from the explorations made by Jerome Bruner into the process of learning. Students organize the items into categories, label the categories, and guess about the identity of the topic. For this, a list of related terms is given by the teacher. This strategy engages students in higher order thinking while enabling them to assimilate new information. Students reveal their prior knowledge as they categorize the words given to them. The cognitive aspects of this strategy can be observed in Bruner, Goodnow, and Austin (1956).
**Steps in Strategy Use**

- The teacher identifies a number of important words or content details and puts them on the board or a chart in a random order. 20 to 25 words may be suitable. (Instead of writing on the board, students might be given a set of cards where one word is written on one card.)

- The teacher organizes the students into small groups and asks them to organize them into categories.

- When the students are done with the work, they are encouraged to explain to the other members their reasoning for including the words under specific categories. Here, they have an opportunity to articulate their thinking and know about others.

- Students may be encouraged to make changes after the discussion.

**Instructional benefits**

This strategy
- stimulates and develops inductive thinking;
- builds the thinking skill of categorizing;
- activates students’ prior knowledge and establishes purpose for learning;
- develops students’ critical thinking through evaluation of each of the details.

**2.6.10 Reciprocal teaching**

Reciprocal Teaching (Palincsar & Brown, 1984) involves conversation between students and teachers, where the teacher models how to lead such a conversation. The teacher thinks aloud to show students how to respond to the reading material, which is followed by students’ taking the lead. This is practised in small and cooperative groups. Over a period of time, as students become more independent, the teacher monitors and evaluates their participation. This strategy makes the learners realize that reading is an interaction between themselves and the text. When they seek clarification from the teacher, they learn how to monitor their own comprehension; and they identify the important points in the text and integrate this content with what they already know when they summarize.
Four comprehension strategies predicting, questioning, clarifying, and summarizing are used in this type of teaching.

*Predicting:* The students hypothesize about what the author might discuss next in the text. This provides purpose for reading. Here an opportunity is provided to the students to link the new knowledge with the old knowledge.

*Clarifying:* Here, attention is drawn to the many reasons for the text difficulty, for instance, new words, unclear referents, unfamiliar concepts, etc. Recognizing these blocks may help the reader to read and re-read fostering for deeper comprehension.

*Questioning:* Students generate questions and attempt to answer them.

*Summarizing:* This activity provides the students an opportunity to identify, paraphrase, and integrate important information in the text.

**Steps in Strategy Use**

- The teacher selects a passage that can be divided into two or three parts.
- The students are asked to read the first section of the passage silently.
- The teacher asks a few questions about the information in the passage and gets the students to respond. Questions at various levels of thinking are asked.
- The teacher summarizes the passage by restating the most important points. The teacher explains why he/she chose certain areas of the passage to form the summary.
- The teacher points out one or two elements in the passage that might impede comprehension: unknown words, unclear referents, complicated syntax, confusing organization, etc.
- The teacher articulates the strategies used for comprehension. These may include rereading a part, guessing from the context, etc.
- The teacher verbalizes what (s)he thinks (she) is going to read next, pointing out in the passage the clues on which (s)he based her/his predictions.
- The next sections of the passage are dealt with similarly. For the next sections, the teacher invites students to participate with their own questions, summary statements, elements that they clarified, and predictions.
• Then the students practice Reciprocal Teaching on their own in small groups of four to six.

**Instructional benefits**

This strategy

• develops text comprehension;
• helps students to learn to monitor their own learning and thinking;
• various levels of thinking such as evaluating, predicting, and metacognition are developed;
• enables peers to support each other’s learning;
• encourages all students to participate.

2.6.11 *Think-Pair-Share*

This strategy was first developed by Frank Lyman at the University of Maryland. This gets students to respond more frequently in class and to stay actively involved by interacting with each other as well as the teacher. The teacher poses a question, gives a prompt, then directs students to *Think* (about the response), *Pair* (with another student for discussion of ideas), and *Share* (student’s thinking with the rest of the class).

This simple questioning technique keeps all the students involved in class discussions and provides an opportunity to share an answer to every question. The teacher allows a few minutes for each step, then moves students to the next step with a signal. Some teachers use hand signals whereas others use a small bell or other audio signal (McTighe & Lyman, 1988). Think-(Write)-Pair-Share is a variation of the strategy. In this strategy, students write their answers before talking with a partner and sharing with the whole class.

**Steps in Strategy Use**

• The students are explained the steps in the strategy.
• The teacher decides on the signal to be used to indicate the start of each step.
• The teacher asks the question.
• The students individually think about an answer for a few seconds.
• The teacher allows the students to discuss their answer with a partner for a few seconds.
• Finally, the students share in teams or call on a few students to share their answers with the class.

**Instructional benefits**

This strategy
• provides time for the students to think about a specific question;
• fosters positive interdependence, giving students opportunities to learn from one another;
• encourages active listening.

**2.6.12 PMI**

PMI stands for Plus/Minus/Interesting, which is a lateral thinking strategy developed by Edward de Bono (1993). It is a valuable improvement to 'weighing pros and cons' technique used for centuries. This is an important decision-making tool. It is also extensively used as a brainstorming technique in business fields. This strategy is primarily concerned with analysis and evaluation of the information. Besides, operations in this strategy are also related to synthesis since alternatives are generated in the process of analysis and evaluation. PMI encourages students to review the positive factors first, then the negative factors, and finally, the interesting possibilities in an idea. This strategy can be used within a range of classroom activities such as analyzing the texts or examining issues.

**Steps in Strategy Use**

• The students are given a situation where they need to make a decision.
• A table might be drawn up on a chart or on the blackboard with headings as Plus, Minus and Interesting.
• In the column Plus, all the positive points of taking the action are written. These can be elicited from the students after pair or group work allotted for the purpose.

• Under Minus, all the negative aspects are written. Here, problems and disadvantages of taking an action are written.

• Underneath the Interesting column, interesting points are written. These are neither good nor bad but points of interest. They are observations and comments. Neutral point also comes under interesting.

**Instructional benefits**

This strategy

• helps students see both sides of an issue or an argument;
• encourages to view things from a different point of view;
• promotes broad thinking about an issue;
• develops the skill of analysis, evaluation and creation.

### 2.6.13 **SWOT analysis**

SWOT refers to Strengths, Weaknesses, Opportunities, and Threats. This technique is credited to Albert Humphrey. Originally, this was a strategic planning method used to evaluate the strengths, weaknesses or limitations, opportunities, and threats involved in a project or a business venture. Performing such analysis leads to the setting up of business objectives. There are many applications of the strategy in academic learning as well. Generally strengths and weaknesses are internal factors while opportunities and threats arise externally. This strategy, which is more widely used in making business decisions, can be used in the classroom to apply at a personal level. For instance, a topic such as 'My Classroom Performance' may be taken up. Doing SWOT analysis on this topic, students identify their strengths, which may include factors such as student knowledge and enthusiasm level. Weaknesses require high level of honesty and self-analysis. The students may identify qualities in themselves such as shyness, slow handwriting, inability to remember new words, etc. Students may have opportunities such as parents helping them out at home, etc. In such case, students are encouraged to recognize such opportunities. Threats such as
competition, changes in syllabus, etc. may also be identified as potential risks to be addressed.

**Steps in Strategy Use**

- The teacher decides carefully on the topic to be discussed or analyzed.
- SWOT templates are created and may be distributed to the students.
- The teacher writes the issue to be discussed on the board.
- The students are asked to do SWOT analysis.
- This may be followed by a discussion or sharing with a partner.

**Instructional benefits**

The strategy

- develops analytical and evaluative skills among students;
- raises awareness as to metaknowledge and metacognition;
- improves efficiency in decision-making;
- enhances skills that helps in defining a problem.

### 2.6.14 SCAMPER

SCAMPER is a powerful strategy that helps in generating ideas when confronted with a problem. It can be used in many problem-solving activities and fosters awareness, drive, fluency, flexibility, and originality (Fragenheim, 2005). It was introduced by Alex Osborn and Bob Eberle.

SCAMPER stands for

S. Substitute (e.g., person, place, time or situation)
C. Combine (e.g., blend assorted ideas and situation)
A. Adapt (e.g., adapt or adjust to suit a purpose)
M. Magnify/Modify (e.g., change shape and modify attributes)
P. Put to other uses (e.g., from the original intention to other uses)
E. Eliminate (e.g., remove any elements, simplify, reduce functions)
R. Rearrange/Reverse (e.g., rearrange or reverse the sequence of the items under review)
Steps in Strategy Use

- The teacher may give a problem and a solution to that problem to the students.
- The students are asked to do the operations in the SCAMPER—Substitute, Combine, Adapt, Magnify, Modify, Put to other uses, Eliminate, and Reverse.
- The students may be asked to re-present the problem, rewrite the story, or review the solution, etc.

Instructional benefits

The strategy

- develops the ability to generate alternatives;
- enhances divergent/creative thinking;
- improves imaginative thinking.

2.6.15 Six thinking hats

Six thinking hats is a method for doing one sort of thinking at a time. Instead of trying to think everything at once, we can wear, according to de Bono (1993), only one hat at a time. Each of the six thinking hats—white, red, black, yellow, green, and blue represents a type of thinking.

White hat represents facts, figures, and information. Putting on this hat means thinking about what information we have and what information we need to get.

Red hat represents feelings, hunches, and intuition. Using this hat means thinking about what we feel about the subject under consideration.

Black hat refers to caution, truth, judgement, evaluation. Wearing this hat means thinking about whether something fits, works, or can be done.

Yellow hat represents advantages, benefits, and savings. Applying this hat would mean analyzing the benefits, the advantages, and the reasons behind them.

Green hat refers to exploration, proposals, suggestion and new ideas. Thinking about alternatives for action, and divergent thinking are the mental operations that come under this hat.
Blue hat refers to thinking about thinking. Putting on this hat means controlling the thinking processes. These are executive processes and hence this hat controls the use of the other hats.

Steps in Strategy Use

Six thinking hats can be better used when there is a problem to be solved or a decision to be made.
- Students are presented with a problem or an instance of decision-making
- The teacher may model the use of each hat by taking an example
- Then the students are divided into groups asking them to discuss using these hats one at a time.
- The students may be asked to present to the class the products or the results of using each hat
- This may be followed by class discussion and teacher feedback

Instructional benefits

Since this strategy contains several hats, it develops several of the mental processes in problem solving and decision making. Skills such as distinguishing between facts and opinions, analyzing the advantages and disadvantages, generating new ideas and executive skills to organize other skills are the benefits of this strategy.

2.6.16 M.A.S.C.

This strategy is developed by Gerard Alford (Fragenheim, 2005). MASC is an effective thinking technique that helps students with tasks involving creative thinking. M.A.S.C. stands for
- Modify: Modify a feature or replace one part with another
- Add: Add a new feature to the object
- Size: Make one part or several parts of the object bigger and/or smaller
- Change: Change the shape, texture, colour, etc.

Using this strategy, students may redesign everyday products, familiar stories or pieces of music. This strategy is very useful with students who are low-achievers.
Since creating a new product or an original story can be very difficult for them, the concept of redesigning encourages them to make changes to the existing story as it is far less threatening.

Steps in Strategy Use

- The teacher gives the students a task of redesigning, for instance, redesigning a toothbrush or a chair.
- The students are asked to modify its feature, for example, pads or cloth instead of bristles; add some new features, make changes to the size, and change the shape of it.
- This can also be used for stories.
- This strategy can be used for students to undertake individually as well as a small group cooperative task, as a result, students tend to generate more creative ideas in a shorter time through teamwork.

Instructional benefits

This strategy has the potential to stimulate creative thinking abilities such as generating new ideas, imagining, and predicting, and critical thinking abilities such as evaluating each change of modification in terms of its utility, economy, etc. This is an invaluable strategy for low-achievers since redesigning can become a springboard for creation of original products and concepts.

2.6.17 Attribute listing

Attribute listing is a creative thinking technique (Halpern, 2003), where an existing product is taken and every characteristic or quality of the item or situation is listed and then examined for possible modification or recombination. To arrive at a creative solution, attributes of, say, a product, such as its shape, consistency, colour, texture, odor, temperature, etc, are listed. Then these attributes are paired randomly to arrive at creative solutions.
Steps in Strategy Use

- The teacher gives a product or a situation that needs to be modified to arrive at a creative solution.
- The students are asked to list out all the attributes of the product or the situation. The teacher may model for the first time so that the students may become familiar with the processes.
- The students may be divided into groups and each group is asked to pair different attributes randomly and arrive at interesting combinations.
- The students, then, present the creative solution to the class.

Instructional benefits

The students' perceptual abilities develop significantly. Since they engage in analyzing the attributes of a situation, their analytical thinking improves. They synthesize various attributes and as a result they generate new solutions, which in turn enhance their creative thinking ability.

2.6.18 Relational algorithm

Crovitz's (1970) Relational Algorithm is a solution guide that relies on changing the relations among items. Crovitz lists 42 relational words. They are:

About, at, for, of, round, to, across, because, from, off, still, under, after, before, if, on, so, up, against, between, in, opposite, then, when, among, but, near, or, thought, where, and, by, not, out, through, while, as, down, now, over, till, with

Crovitz suggests that when we are in need of a creative solution, the different possible relationships between the elements involved in the situation may be explored using these 42 words.

Steps in Strategy Use

- The teacher gives a problem for which a creative solution is sought.
- The teacher may help or get the students to identify two key elements in the problem.
• The students, in groups, are asked to use the relational words to link the elements in the problem, which may result in creative solutions.
• The solutions are presented before the class and then discussed.

**Instructional benefits**

This strategy
• stimulates the cognitive processes deeply;
• generates ideas;
• gives unusual insights into the relationship between the elements involved.

### 2.6.19 Socratic dialogue

The Socratic method of questioning is named after the Greek philosopher Socrates (469 BC -399 BC). Though there are a few versions and styles of this method, the modern Socratic method is a process of inductive questioning that leads a person to attain knowledge, solve a problem, or reconsider existing beliefs. While the earlier versions of Socratic method is deconstructive in nature, the modern style is constructive. However, it is also possible to blend styles depending on the objective laid down by the teachers.

Being the oldest and the most powerful teaching strategy for developing critical thinking, this method focuses on giving questions, not answers. In this method, the Socratic questioner or the teacher encourages the class to think in a disciplined way through facilitative questioning that carefully leads the students to understand and assimilate new knowledge of reexamine the existing knowledge and beliefs. In this process, the diverse responses of the students must be regarded as various kinds of overlapping thoughts that occur in their minds. The teacher needs to strategically choose the relevant responses of the students to guide them to the required knowledge goal. At the same time, other responses that are irrelevant should also be addressed in such a way that the students realize the irrelevance. Yet, care needs to be taken so that the focus of the discussion is maintained.

**Steps in Strategy Use**

• The students and the teacher decide on the topic to be discussed.
• The teacher might begin by asking a stimulating question for which the students respond.

• The teacher, then, points out various dimensions and exceptions of the issue under discussion.

• Through careful and strategic dialogue with the students, the teacher makes the students think deeply and observe their knowledge and thought processes.

• The students are given clarifications, as a result of which they understand or learn new knowledge, modify their thought processes, etc.

**Instructional benefits**

This strategy

- develops the ability to articulate one's thoughts;
- improves metacognitive thinking;
- enhances speaking skills;
- helps students consider multiple perspectives of an issue.

Effective thinking does not happen automatically. Thinking is effortful. Therefore, it needs to be taught overtly and explicitly, practised regularly, religiously, and rigorously. Student attempts at thinking need to be recognized, appreciated, and encouraged by teacher modeling. Teachers should let the students discern the alternative strategies presented to them and provide opportunities to comprehend their use in real life, which provides an impetus for them to practise at school. All the strategies presented here offer teachers a scope for teaching thinking skills along with a focus on the language skills and elements.

Each of the strategies can be used for different grade levels and in different content areas though the specific examples mentioned were related to language teaching. It is quite possible, in fact, highly beneficial to integrate two or more strategies to achieve intended objectives of developing thinking skills. For example, students can brainstorm to predict the information in a piece of text given to them followed by using graphic organizers to map the text and then use Crovitz's *Relational Algorithm* to find a solution presented in the text.
When teachers believe that it is possible to teach thinking strategies, they will empower students to become independent thinkers and learners who can transfer learning and thinking strategies to other aspects of their learning.

In the above sections, we have seen various strategies used for teaching thinking. Though they are not exclusively used in language teaching, language is used as a medium in most of the above thinking strategies. Therefore, it is necessary for us to understand the relationship between language and thinking, and further, thinking and English language teaching.

2.7 Thinking and English language teaching

Our current understanding tells us that thinking is not completely based on the resources of language but it is very much influenced by language as language develops. Although it is not clear what the consequences of learning to read and write are for children’s thinking (Fox, 1998), it is now believed that teachers can enable students to improve their ability to solve problems, to make decisions by helping them develop proficiency in thinking skills (Marzano, 1993). Through language use in the classrooms, teachers can significantly activate and develop students’ thinking. Listening, Speaking, Reading, and Writing are aspects of complex sets of activities which have the potential to develop student thinking. Since thinking and linguistic abilities of students are equally important, language teachers need to develop both competencies. In view of this, it is important to understand how instruction in Listening, Speaking, Reading, and Writing are associated with the development of thinking skills.

Before we discuss the relationship between the four skills and the thinking abilities, it is necessary to understand how thought and language are connected. The connection between language and thought has been intriguing to philosophers and psychologists, linguists, and anthropologists for centuries. It is quite appealing to one’s intuition that we think in a language. This implies that if there is no language, there is no thought (Gleitman & Papafragou, 2005). But the issue is not as simple as it seems.
As regards the relationship between language and thought there can be three possible relationships (Siegler, 1998): language shapes thought; thought shapes language; and language and thought influence each other.

Language shapes thought: Many developmental psychologists also saw the connection between language development and cognitive development. This claim, popularly known as Sapir-Whorf Hypothesis or Linguistic relativity, represents an approach to linguistic determinism. According to this hypothesis, speakers of two different languages (English and Hopi) think differently or differences in language result in differences in thinking. It is founded on the notion that language shapes thought so profoundly that one’s view of the world is determined by the language habits of the community one lives in. Such a view is known as linguistic-specific view.

Contrastingly, according to linguistic-general theory, “the interesting contrast isn’t between speakers of English versus speakers of Hopi; it is between speakers of any language versus those people or animals who have no language at all” (Bloom & Keil, 2001; 352). This means that the syntactic structures that are common to all languages can have a significant impact on thought and hence the distinction is between knowing a language and not knowing a language.

While language is viewed to have influence on thinking, is it words or syntax that can have a profound impact? Some scholars posit that specific words help us break the reality into chunks while others propose that through syntax our thoughts are threaded in a complex way. However, such distinction is oversimplified in that the complex functions of morphology and semantics between words and syntax make it very difficult to attribute the influence on thought to only two linguistic elements.

Whorfian hypothesis has been strongly challenged by psychologists such as Pinker (1994) pointing out that people think in images as well as words and in abstract logical propositions. According to him, people do not think in English or any other language but in a language of thought, which he calls mentalese. The Sapir-Whorf hypothesis has been considered by many as an extreme position and its weaker version is also popular among researchers: language influences rather than determines thought.
Thought shapes language: This position can be seen in the works of Piaget. For Piaget, cognitive development precedes language, which means children’s language is always unable to convey what is not already established as a thought (Robson, 2006). He argues that early language of a child is egocentric and it is only with the concrete operations that speech becomes social. Thus, according to Piaget, thought shapes or leads to language.

Language and thought influence each other: This theoretical position is asserted by Vygotsky (1978), who explains that the true development of thinking is not from the individual to the social but from the social to the individual. Vygotsky sees what Piaget calls egocentric speech as an instrument of thought. For him this egocentric speech does not disappear but gets internalized and becomes inner speech. This inner speech manifests when children and adults think through their problems. Hence, we can say that the egocentric speech that is transformed into inner speech becomes a tool for self-regulation and metacognition.

On the whole, it may be understood that language and thought are so inextricably linked that the development of one can aid the development of the other and they also have an interfunctional relationship between them.

Having understood the relationship between language and thought and the influence of words and syntax, we shall discuss the connection between thinking and the teaching of four language skills.

Effective listening is the foundation of effective language and a prerequisite for effective thinking. We spend more time in listening than we do talking, reading and writing combined, and without proper listening we cannot make proper judgment. Highly effective problem solvers spend a great deal of time and energy listening. “Some psychologists believe that the ability to listen to others, empathize with them, and understand their points of view is one of the highest forms of intelligent behaviour” (Costa, 2001, p. 81). Listening, unlike general understanding, is not a continuous process but an intermittent process. Listening happens “in patches, breaking off now and then while our thoughts run ahead in anticipation, or while we seek to relate what has been said to our own thoughts and experiences” (Elliott-
Cannon, 1962, p. 2). In the gaps between patches, a listener actively tries to connect the new incoming information to the existing information in one's schemata and vice versa.

It is important that the students need to be motivated to devote their mental energies to listen to others and think from their points of view. Students are to be trained in such a way that they need "to hold in abeyance their own values, judgments, opinions, and prejudices in order to entertain another person's ideas" (Costa, 2001, p. 81).

Teachers can utilize the classroom time in developing the thinking skills and dispositions through several strategies. One of the strategies is deliberately enhancing the time given to the student in responding to teacher questioning. In the teaching of listening, the idea of "thinking time" from the standpoint of a listener-student or "wait time" from the teacher's point of view helps in students' sustained thinking (Cooper & Jenson, 2009). However, Tobin (1987) concludes that through extended wait time facilitates higher cognitive learning, it cannot guarantee the development. Further, Beyer (1984) points out that teacher generated questions—"whether on worksheets, in textbooks, or asked by teachers", do provide students with an opportunity to think "but not always the type and quality of thinking the designers intended" (p. 489).

With regard to the relationship between speaking and thinking, it is the most used means of making our thinking explicit to ourselves as well as to others. In connection with this, Vygotsky (1962) quotes O.Mandelstam: "I have forgotten the word I intended to say, and my thought, unembodied, returns to the realm of shadows" (p. 119).

This is also supported by Merill Swain's (2005) output hypothesis, which states that spoken output is a necessary condition for language acquisition. She argues that if the students are encouraged to produce language, it provides them with an opportunity to notice gaps in their current knowledge, which helps them in acquiring the language. This is closely linked with thinking in that speech articulates our thoughts, and it allows us to notice the gaps not only in language knowledge but also in thoughts—the gap between what we want to convey and what is actually conveyed. This noticing helps an individual engage in metacognition. This individual thinking
gets integrated with the interpersonal communication in which language use transforms individual thought into collective thought and action (Mercer, 2000) through mutual agreement and disagreement of the ideas. This use of dialogue is an important productive strategy in the teaching of thinking skills.

Reading has often been described as a higher-order skill (Resnick, 1987). Most students achieve a partial fluency in reading but fail to tune in properly to the meaning of the text, let alone looking at it critically (Fox, 1998). Palinscar and Brown's (1984) Reciprocal Teaching has been successful in improving comprehension. In this strategy, the teacher models predicting, summarizing, questioning, and clarifying processes in order to monitor and improve comprehension. The students then comment on the quality of questions and attempt to construct better ones. Through a process of cooperative questioning between the teacher and students, reciprocal teaching emphasizes metacognitive processes in reading comprehension.

Exposure to different literary genres such as advertisements, stories, books, letters, etc., can have a significant impact on students' own internal thought processes (Fox, 1998). However, mere exposure is not a sufficient condition for the development of thinking abilities. Teacher intervention, as in the case of reciprocal teaching, in the enhancement of thinking skills can have significant positive impact on the students' thought processes.

As regards the relationship between thinking and writing, Nickerson (1984) has stated that “writing is viewed not only as a medium of thought but also as a vehicle for developing it” (p. 33). Writing is a complex and challenging experience that demands intellectual activity. The role of writing in the development of thinking is unique given its distinct characteristics:

(1) the permanence of the word, allowing the writer to rethink and revise over an extended period; (2) the explicitness required in writing, if meaning is to remain constant beyond the context in which it was originally written; (3) the resources provided by the conventional forms of discourse for organizing and thinking through new relationships among ideas; and (4) the active nature of writing, providing a medium for exploring implications entailed within otherwise unexamined assumptions. (Langer & Applebee, 1987, p. 5)
Thus, the nature of writing demands rigorous cognitive activity in which the writer makes connections in the existing schemata and organizes the information for presentation. A key aspect in this is that the writer has to transform the cognitive activity which is associative in nature to present written discourse that is linear in nature. So, good writing demands rigorous thinking, which is not easy. While the act of writing involves high-level cognitive processes in the manipulation of information, these processes can be the focus of instruction so that they are helpful in solving problems and making decisions in real life. In this approach, writing becomes a tool in the teaching of thinking.

In this context, the process approach to writing comes close to the teaching of thinking. Flower and Hayes (1981) developed a cognitive process theory of writing, according to which complex cognitive processes take place as the writer goes through several phases of writing such as planning, writing, revising, editing, etc. In relation to this aspect of cognition in composition, Reagan (2009) observes three key aspects which are central to it:

One is that deep and careful thinking before, as well as during, writing is necessary for deep and careful writing. The second idea is that such deep and careful thinking...[called] "skilful thinking" needs to include both the exercise of thinking skills and the use of relevant Habits of Mind. And the third concept is that the most effective way that skilful thinking can result in such deep and careful writing is through the use of "writing maps" as part of thoughtful engagement by the students in the "standard" stages of the writing process... (p. 152)

However, the cognitive processes articulated in the process approach to writing are aimed at producing a written discourse rather than the development of the higher-order thinking abilities. Little attention has been paid to the teaching of various generalizable thinking skills and processes through writing in the manipulation of information, which can cut across curriculum and help students solve problems and make decisions in their real life. Nevertheless, it cannot be simplistically concluded that the focus on the cognitive processes in the process approach do not lead to transfer but it is highly possible, as research suggests, that the explicit focus on the cognitive processes aiming at problem solving and decision making can enhance higher-order thinking skills among students. Fisher and Frey (2007) note that "writing
offers an excellent pathway for brainstorming, clarifying, and questioning” and provides evidence of “increased student performance when writing is used as a tool for thinking” (p. 57) at elementary and high school level.

In order to capture and analyze students’ thinking processes, writing can aid as a strong evidence of students’ thinking processes. Given the distinct characteristics of writing process mentioned above, we can see “writing as a way for us to learn about students’ thinking” (p. 57).

It follows from the above that there is a strong relationship between the teaching of language skills and thinking skills. Thinking is implicit in all the teaching of the four language skills. However, merely planning and teaching the four language skills with the aim of developing communicative competence does not realize all the goals of a second language curriculum. Moreover, teaching language skills may not guarantee the development of students’ thinking. In an investigation conducted by Rajendran (1998), it was found that the teaching of four language skills was not utilized maximally in promoting higher-order thinking. However, it is generally thought by many educators that thinking already exists in the ESL curriculum. It is argued here that though certain thinking skills can be found in language tasks and activities, the primary objective of those tasks and activities is to develop linguistic skills. It does not explicitly focus on teaching of thinking skills. In what follows, we shall discuss various aspects of English language teaching to understand the necessity of teaching thinking in the ESL curriculum. Hence, there needs to be an explicit emphasis on the development of thinking skills in the language curriculum.

Some of the experts in ELT would assert that thinking is already embedded in the notion of communicative competence. Let us understand the notion of communicative competence with reference to thinking abilities.

2.7.1 Communicative competence and language teaching

The goal of Communicative Language Teaching (CLT) is to develop communicative competence. Dell Hymes introduced this term in 1972 expanding Chomsky’s definition of grammatical competence. Hymes pointed out that “there are rules of use without which the rules of grammar would be useless” (Hymes, 1973, as
cited in Johnson, 2004, p. 87), which means when a child acquires a language, the knowledge of the sentences is acquired along with the knowledge of appropriateness in terms of audience, time, place, and manner etc. This, he calls, sociolinguistic competence. This functional view of language is in sharp contrast with the structural or formal view explained by Chomsky. Hyme’s notion of communicative competence contains two components: “knowledge” (grammatical and sociolinguistic competence) and “ability for use” (noncognitive factors such as motivation, courage, dignity, stage confidence, etc.) (Johnson, 2004, p. 89).

Since Hyme’s view of language was found relevant to the context of second language acquisition, some of the researchers such as Michael Canale and Merrill Swain developed Hyme’s model of communicative competence for second language acquisition, which contained three components in the 1980’s model, and later Canale added discourse competence to the model in 1983.

Accordingly, the four types of competence are grammatical, sociolinguistic, strategic, and discourse. Grammatical competence is explained as containing “knowledge of lexical items and of rules of morphology, syntax, sentence-grammar semantics, and phonology” (Canale and Swain, 1980, p. 29). Sociolinguistic competence includes “knowledge of the rules of language use” (p. 30), which are specific to a cultural setting. Strategic competence is defined as “verbal and non-verbal communication strategies that may be called into action to compensate for breakdowns in communication due to performance variables or to insufficient competence” (p. 30), and discourse competence is concerned with the “mastery of how to combine grammatical forms and meanings to achieve a unified spoken or written text [through cohesion and coherence] in different genres” (Canale, 1983, p. 9). In the above Canale and Swain’s model, “ability for use” proposed by Hymes under competence is included under actual performance. However, implicit references to it can be found in the strategic and sociolinguistic competence.

Lyle F Bachman (Bachman, 1990) proposed a more refined version called Communicative Language Ability Model, which consisted of “both knowledge, or competence, and the capacity for implementing, or executing that competence in appropriate, contextualized communicative language use” (p. 4), presented in three
components: language competence, strategic competence, psychophysiological mechanisms. But the term language competence was replaced with language knowledge (Bachman & Palmer, 1996) and hence all the components under it also underwent the similar modification. Accordingly, Language knowledge includes

- Organizational Knowledge: Grammatical Knowledge and textual Knowledge
- Pragmatic Knowledge: Functional Knowledge and Sociolinguistic Knowledge

Unlike in Canale and Swain’s model, strategic competence is considered as a separate component, which is a set of metacognitive strategies containing “higher-order executive processes that provide a cognitive management function in language use, as well as in other cognitive activities” (1996 p. 70). The areas of metacognitive strategies use are: goal setting, planning, and assessment. Nevertheless, Bachman and Palmer’s interest lies in how strategic competence is realized in a language testing situation.

As we have seen, the construct of communicative competence in the first two models by Hymes followed by Canale and Swain and the third one: Communicative Language Ability model by Bachman and Palmer, the focus is clearly on discourse. Though cognitive processes are involved in the processing of the input for language performance, the objective is restricted to decoding the language input and encoding for conveying spoken or written message. Simply put, the primary aim is to develop communication skills rather than thinking skills.

With respect to the metacognitive strategies as a part of strategic competence, it appears that thinking skills are involved in this component. But still, the aim of applying a metacognitive strategy is language performance, i.e. production or comprehension, but not the metacognitive thinking about thinking skills and dispositions, which are used in making a decision, solving a problem, generating a new idea, identifying bias in a claim or an argument, etc.

Hence, it follows from the above that the primary focus of CLT is communication, and thinking is viewed as something that automatically develops. The current study aims at developing thinking abilities of the students by using
English language as a medium and in the process it also attempts to look at how this kind of focus influences their language abilities.

A closely connected concept in the communicative competence is strategies. Since the use of the term metacognitive appears as a part of strategic competence, it might occur to one that metacognition is taught in the ESL curriculum already. The concept of strategies needs a little discussion.

2.7.2 Language learning and communication strategies

O’Malley and Chamot (1990) define language learning strategies as having learning facilitation as a goal and are intentional on the part of the learner. The goal of the strategy use is to affect the learner’s motivational or affective state, or the way in which the learner selects, acquires, organises, or integrates new knowledge. (p. 43)

Oxford (1990) defines learning strategies as “steps taken by learners to enhance their own learning” (p. 1). She defines language learning strategies in a much broad way, unlike other researchers such as H.H. Stern and Rod Ellis, and they include all possible behaviours that facilitate the learning process. Oxford categorizes the strategies into two kinds: Direct and Indirect. Direct strategies include 1) memory strategies 2) cognitive strategies and 3) compensation strategies. Indirect strategies include 1) metacognitive strategies 2) affective strategies and 3) social strategies.

Oxford’s cognitive strategies include the mental processes involving practicing, receiving and sending messages, analyzing and reasoning (for example, expressions), and creating structure for input and output. Metacognitive strategies involve centering one’s learning, arranging and planning one’s learning, and evaluating learning. On closer observation, it is quite apparent that the strategies such as analyzing, reasoning, and planning are related to linguistic input or output. The cognitive and metacognitive processes are restricted to processing of discourse. These strategies do not involve abilities such as identifying a bias in a claim, identifying a logical fallacy in an argument, considering multiple perspectives in an issue, etc., aiming at solving problems and making decisions.

Another offshoot of the communicative language teaching approach is the predominant use of tasks. As a task is generally conceived to be cognitively
demanding, it might be assumed that a task automatically develops thinking abilities. A brief discussion about task based language teaching is necessary to understand the importance of teaching thinking.

2.7.3 Task-based language teaching

Three new task-based syllabus types appeared in the 1980s (Long and Crookes, 1992): (a) the procedural syllabus (b) the process syllabus (c) the task-syllabus. Though process syllabus is seen as different from task-based syllabus, the conception of task is crucial to all the three types. In the existing literature on task-based approach to language learning, quite a few definitions have been offered by the experts.

Prabhu (1987) defines a task as “an activity which required learners to arrive at an outcome from given information through some process of thought, and which allowed teachers to control and regulate that process” (p. 24). In this definition, we can see the emphasis on the “outcome” and the cognitive processes involved in the performance of the task.

Long (1985), defines a task as a piece of work undertaken for oneself or for others, freely or for some reward. Thus examples of tasks are painting a fence, dressing a child, filling out a form, buying a pair of shoes, making an airline reservation, borrowing a library book, taking a driving test, typing a letter, weighing a patient, sorting letters, making a hotel reservation, writing a cheque, finding a street destination and helping someone across a road. In other words, by ‘task’ is meant the hundred and one things people do in everyday life, at work, at play and in between.” (Long, 1985, as cited in Nunan, 2004, p. 2)

Task here refers to what people do in real life situations. It is quite noticeable that the emphasis is on communication but not on the process of solving a problem or making a decision and thus developing thought processes. More importantly, Long defines a task as it occurs in the real world but realizing these tasks in a classroom attracts several problems—some of these are not possible in pedagogical situations while others are of not much interest to language teachers. Nunan (2004) defines a task as
a piece of classroom work that involves learners in comprehending, manipulating, producing or interacting in the target language while their attention is focused on mobilizing their grammatical knowledge in order to express meaning, and in which the intention is to convey meaning rather than to manipulate form. (p. 4)

As in the case of Prabhu’s definition, Nunan emphasizes on the outcome: “the task should also have a sense of completeness, being able to stand alone as a communicative act [emphasis added] in its own right with a beginning, middle and an end” (p. 4). Further, Nunan defines a task, unlike Long’s real world task, from a pedagogical perspective. Even in Nunan’s definition, we can see that the aim of a pedagogical task is to provide an environment in the classroom where the learners develop their communication skills but not thinking skills.

Skehan (1998) characterizes a task in which,

- meaning is primary;
- learners are not given other people’s meaning to regurgitate;
- there is some sort of relationship to comparable real-world activities;
- task completion has some priority;
- the assessment of the task is in terms of outcome (as cited in Nunan, 2004, p. 3.).

An important aspect in Skehan’s definition is the emphasis of cognitive process as a key attribute of a task. Similarly, Robinson (2001) presents cognitive factors involved in task complexity such as number of elements, reasoning demands, planning, and prior knowledge. These cognitive factors are involved in activating prior knowledge and processing the language input in order to come out with an outcome. Though certain of the cognitive factors such as ‘reasoning’ are definitely involved in task performance, the main objective of such performance is not developing the reasoning abilities per se but developing communicative competence. This point is more obvious when various tasks are observed in that the construct of the reasoning or thinking abilities that characterise tasks are not properly articulated in the existing literature since the focus is on linguistic skills.

Willis and Willis (2007) present various types of tasks involving listing, sorting, classifying, sequencing, rank ordering, matching, comparing, problem-solving, etc. Though thinking skills are involved in these tasks, developing those
thinking skills is not the aim of those tasks. This is quite apparent in the absence of the articulation of the specific thinking skills involved in each communicative task. Generally, there seems to be an assumption that by giving cognitively demanding communicative tasks, students would automatically engage in thinking. But Beyer (1984) points out that simply posing questions cannot guarantee the development of thinking abilities among students since the students as well the teachers do not have conscious awareness and control of the thinking skills that go into the task performance.

Hence, it can be argued that though thinking does take place in certain cognitively demanding tasks, the primary aim of these tasks still remain skills and elements in terms of discourse but not the skills and abilities such as seeking evidence, distinguishing between facts and opinions, identifying bias in a claim, generating alternatives, identifying logical fallacies, etc. Furthermore, developing thinking is not the issue of only skills but also of dispositions. Dispositions are so central to thinking that without willingness, it is not possible to engage in conscious thinking activity. But, thinking dispositions virtually do not figure in the ESL curriculum.

Thinking abilities and dispositions are highly interrelated and only conscious and consistent endeavour by the teachers over a period of time in explicit teaching of thinking skills and dispositions can result in the development of thinking.

2.8 Components of teaching thinking

In the above section, the necessity of teaching thinking in the ESL curriculum was discussed. It is also necessary to understand what skills and dispositions constitute such teaching thinking. There are a number of taxonomies, lists, and models of thinking, which were reviewed in section 2.2. Nevertheless, given the complex nature of thinking, most of the existing models concentrate on a specific or few aspects of thinking. Further, many of them do not place importance on thinking dispositions.

For instance, Bloom’s (1956) taxonomy and its revised version concentrated predominantly on thinking skills but not on dispositions. Robert Ennis’ list of critical
thinking abilities and Marzano’s taxonomy of educational objectives do not capture creative thinking skills. De Bono’s CoRT thinking program does not consist critical thinking skills such as identifying assumptions, conclusions, etc. Gardner’s theory of multiple intelligences contains broad categories that the specific thinking skills involved in each domain are difficult to arrive at. Further, thinking dispositions are not a part of the theory.

Further, many stand-alone programmes have been developed by experts to develop thinking skills. Such one-off programs might raise awareness on certain skills but disposition to think cannot be inculcated in a short span of time. Consistent effort by educators is necessary to achieve sustained development in thinking.

There is evidence that the use of activities which encourage active mental processing has still not become widespread in a number of ELT situations. “One reason for this may be lack of awareness about how levels of thinking can be conceptualized in ELT activities” (Waters, 2006, p. 319). Hence, there is a necessity for a comprehensive list of components, i.e., thinking skills and dispositions, which can be used by English language teachers, syllabus designers, and materials producers.

One of the obstacles to effective teaching and learning of thinking skills and dispositions lies in our failure to identify with precision those cognitive operations that constitute the individual skills we choose to teach. For example, what cognitive procedures do we engage in when we compare two or more things? What goes on in our minds when we distinguish fact from opinion, apply a previously learned concept to new information, or generalize from specifics? If we knew the essential components of these thinking skills, we could devise better ways to teach these skills to students.

What teachers do under the guise of skills teaching is skills-testing. For instance, following the directions of the Indian National Curriculum Framework, 2005, higher order thinking skills questions figure in the question papers of class X of CBSE syllabus. What about the teaching of thinking skills? There is an assumption that the current syllabus and its components automatically develop thinking skills. In fact, what is being delivered is a set of facts, not how to process those facts in complex
ways—distinguishing between facts and opinions, identifying unstated assumptions, identifying logical fallacies, etc. Though in English language teaching, texts used for teaching have the potential to tap some thinking skills, they cannot be noticed and learnt by the students unless there is an explicit reference to it. Therefore, teachers as well as students have minimal or no conscious awareness or control over their cognitive processes. They are taught what to do but not how to do. For instance, in teaching writing, certain of the prewriting tasks includes activities such as brainstorming, which involves generation of ideas. Students are asked to brainstorm before they proceed to writing the responses, where it is taken for granted that they have the ability to brainstorm automatically. Instead, teaching thinking focus on how to generate ideas using various strategies, heuristics, etc. Explicit teaching of thinking skills and dispositions can help improve students’ learning processes of not only English language but also other subjects. Further, it can also help students to solve problems and make better decisions in their lives. Justification for such view lies in the generally agreed notion that the language is an instrument for thought. So, developing thinking skills and dispositions with an objective of developing critical, creative, and metacognitive thinking is nothing but fulfilling the goals of language curriculum.

Then, some other questions arise: What are the components of teaching thinking? How can they be taught so that transfer takes place? How are they assessed? The current study attempts to review the literature to delineate the thinking skills and dispositions to be taught in the English language curriculum. To teach these skills and dispositions, an intervention programme would be taken up using strategies and heuristics. An assessment system would also be devised to assess the development of thinking abilities. The description of the intervention study and the assessment system used for the study will be discussed in the next chapter. In what follows, we shall discuss the components of teaching thinking.

In this study, it is attempted to draw from various models of thinking and intelligence to form a comprehensive and operationally productive description of components of thinking for the purposes of teaching in the ESL curriculum. Teaching of thinking has been acknowledged by many as an important goal of education but this
is a skill-centered conception of thinking. Few would argue against the goal of teaching students to be good thinkers, but teaching thinking skills is not enough. As stressed by the experts such as Robert Ennis, Jonathan Baron, David Perkins, teaching thinking means more than inculcating specific thinking skills; it means teaching students to be disposed to think creatively and critically in appropriate contexts. Accordingly, from an educational perspective, thinking can have two distinct dimensions: *skills* and *dispositions*.

Figure 2.3 depicts the components of thinking, which has two dimensions—1) Skills and Strategies and 2) Dispositions. The Skills dimension is classified into two types i.e., Cognitive and Metacognitive. Cognitive skills are further classified into
five categories—Core Thinking Skills, Critical Thinking, Creative Thinking, Problem Solving, and Decision Making. Similarly, Metacognitive skills are sub-divided into three categories, namely, Planning, Monitoring, and Assessing.

The Dispositions dimension contains several thinking dispositions that form six categories: Inquisitiveness, Open-mindedness, Orderliness, Analyticity, Truth-Seeking, and Metacognition.

**Thinking Skills and Dispositions**

<table>
<thead>
<tr>
<th>Category</th>
<th>Skill/Disposition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Core Thinking Skills</td>
<td></td>
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<tr>
<td>Critical Thinking</td>
<td></td>
</tr>
<tr>
<td>Creative Thinking</td>
<td></td>
</tr>
<tr>
<td>Problem Solving</td>
<td></td>
</tr>
<tr>
<td>Decision Making</td>
<td></td>
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<tr>
<td>Metacognitive Skills</td>
<td></td>
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<tr>
<td>Planning</td>
<td></td>
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<tr>
<td>Monitoring</td>
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<tr>
<td>Assessing</td>
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<tr>
<td>Inquisitiveness</td>
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<tr>
<td>Open-mindedness</td>
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<tr>
<td>Orderliness</td>
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<tr>
<td>Analyticity</td>
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<tr>
<td>Truth-Seeking</td>
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<tr>
<td>Metacognition</td>
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</tbody>
</table>
### Table 2.1 List of thinking skills and dispositions

<table>
<thead>
<tr>
<th>Metacognitive Skills</th>
<th>Dispositions Dimension</th>
</tr>
</thead>
<tbody>
<tr>
<td>Problem Solving Skills (PSS)</td>
<td>Inquisitiveness (INQ)</td>
</tr>
<tr>
<td>Decision Making Skills (DMS)</td>
<td>Open-mindedness (OPM)</td>
</tr>
<tr>
<td>Planning (PLAN)</td>
<td>Orderliness (ORD)</td>
</tr>
<tr>
<td>Monitoring (MN)</td>
<td>Analyticity (ANL)</td>
</tr>
<tr>
<td>Assessing (ASN)</td>
<td>Truth-Seeking (TRS)</td>
</tr>
<tr>
<td>Thinking Strategies (TST)</td>
<td>Metacognition (MC)</td>
</tr>
<tr>
<td>Heuristics</td>
<td></td>
</tr>
<tr>
<td>Algorithms</td>
<td></td>
</tr>
<tr>
<td>Critical thinking</td>
<td></td>
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<tr>
<td>Empathetic</td>
<td></td>
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<tr>
<td>Self-regulation</td>
<td></td>
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<tr>
<td>Self-efficacy</td>
<td></td>
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<tr>
<td>Personality traits</td>
<td></td>
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<tr>
<td>To be curious</td>
<td></td>
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<tr>
<td>To try to be well informed</td>
<td></td>
</tr>
<tr>
<td>To consider multiple points of view</td>
<td></td>
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<tr>
<td>To try to consider even seemingly implausible alternatives</td>
<td></td>
</tr>
<tr>
<td>To be broad and responsibly adventurous</td>
<td></td>
</tr>
<tr>
<td>To plan and be strategic</td>
<td></td>
</tr>
<tr>
<td>To determine and maintain focus</td>
<td></td>
</tr>
<tr>
<td>To seek, offer, and evaluate reasons</td>
<td></td>
</tr>
<tr>
<td>To seek clarity about intended meanings</td>
<td></td>
</tr>
<tr>
<td>To seek and offer evidence</td>
<td></td>
</tr>
<tr>
<td>To withhold judgment when evidence is insufficient</td>
<td></td>
</tr>
<tr>
<td>To be aware of one's beliefs and knowledge</td>
<td></td>
</tr>
<tr>
<td>To try to use one's thinking abilities and strategies</td>
<td></td>
</tr>
</tbody>
</table>

114
In table 2.1, all the skills, strategies, and dispositions of the components of thinking are listed. In the sections that follow, the justification for grouping the skills/dispositions into categories will be provided.

The components in the list have been pooled from various constructs of thinking developed by noted scholars such as Benjamin Bloom, Robert Ennis, Richard Paul, David Perkins, Robert Marzano, Robert J Sternberg. Based on the review of the literature done by the researcher, the descriptions of the categories are provided below. Some of these frameworks were reviewed in section 2.2. The rationale for categorizing is made clear in the description of the skills and dispositions in the sections that follow the table.

Before providing the description of the categories in the components of teaching thinking, it is important to acknowledge the limitations of the researcher's effort. The list of thinking skills and dispositions is not to be understood as a taxonomy or a theoretical framework, rather it should be seen as only a list of thinking skills and dispositions that can be used in teaching thinking. The list of components is meant to be useful to teachers, teacher educators, and curriculum designers and hence this is not a model of how mind works. The dimensions and categories are neither completely discrete nor comparable; and they overlap and related to each other in multiple ways. In a real life problem situation, the skills and strategies occur simultaneously.

The list outlines the thinking skills and dispositions without specifying grade level, sequence, emphasis, or the teaching approach. Educators need to use this list as a resource to match the ESL curriculum objectives and the needs of the students. It should be noted that since this list has operational force, the skills, strategies, and dispositions can change from time to time based on the advancement of research in this area. It is not the intent behind the list to claim that the skills and dispositions mentioned are final ones. Depending on various educational needs that arise from time to time, some of the skills might be added or viewed as unnecessary.
2.8.1 Cognitive Skills

In this sub-dimension of skills, there are 5 categories of thinking skills: Core Thinking Skills, Critical Thinking, Creative Thinking, Problem solving and Decision Making. The category of Thinking Strategies is common to both cognitive and metacognitive skill types.

2.8.1.1 Core Thinking Skills

Core thinking skills have simple procedural steps when compared with other sub-dimensions. They are skills related to information gathering and organizing. Though their procedural components are limited, they are essential for the functioning of the other dimensions in the model. Though the skills and strategies are presented in a linear pattern, no hierarchy is claimed and they occur simultaneously in a complex thinking situation.

Information gathering skills include observing and recalling, both of which are basic abilities required to perceive the world and retrieve the information stored in the memory. Observing involves gathering information from the world through senses. Direct observation includes obtaining firsthand information through seeing, hearing, touching, tasting, and smelling whereas indirect observation involves reading, listening to recordings, examining graphs and other materials to gather vicarious information (Hannah & Michaelis, 1977). Information thus gathered is stored in the memory, which is generally called encoding, and is recalled for cognitive processing to perform a task. The information stored might be declarative, procedural, conditional, or metacognitive in nature and include concepts, themes, principles, rules, laws, feelings, impressions, etc.

Conceptualizing occurs when people seek to generalize from specifics or invent concepts or models (Beyer, 1987). This includes identifying attributes or characteristics, examples, and non-examples. One’s ability to identify attributes or characteristics, focus on the details such as size, colour, parts, material, shape, etc, affects the process and quality of encoding. These attributes or characteristics are applied to various examples to form a concept. In such process, one needs to distinguish between examples and non-examples. A concept is a set of characteristics,
which are usually represented by a language label or an image. A fact is verifiable information while a concept is a generalization about what is true of any and all items that are examples of the same category (Seiger-Ehrenberg, 2001). Hence, a concept is abstract and cannot be put to verification of their truth value. To form the concept of fruit, one needs to identify its characteristics, examples such as apple, orange, grape, and distinguish its non-examples such as potato, carrot, spinach, etc.

Organizing refers to the arrangement of information to understand or present effectively. The skills of organizing give structure and help in better and quality retrieval of information. Skills that fall under this sub-category are discussed below.

Identifying similarities and differences or comparing and contrasting between persons, things, or ideas are basic abilities in organizing information. In doing so, one needs to generate or develop a basis or a criterion for making comparison. Comparing can also be complex depending on the nature of the task involved. Comparing two dogs on the criterion of size is simple whereas comparing a dog and a buffalo is complex in that it needs the conscious recognizing of the super-ordinate criterion basis for such comparison.

Classifying or categorizing involves grouping or sorting items into categories based on the identified characteristics, developed criteria, and identified similarities and differences. Categorizing is an important skill since we need to make sense of unlimited number of stimuli present in the world. Although students at school classify many items as a part of their syllabus, they generally do not deliberately use categories to remember information (Marzano, 1988).

Ordering is closely related to classifying, and it means sequencing items based on given or developed criteria. This skill helps in recall of information. Ordering seems to be relatively simple but given the task type, it can be difficult and complex. For instance, sequencing events chronologically in an autobiography of a famous personality is not a simple task. The difficulty and complexity increases depending on the number of criteria, i.e., time, shape, color, parts, price, etc., stipulated for ordering.
Representing refers to changing the form of information to understand or present in a better a way. Representing can take place internally or externally (Hayes, 1981). An Internal representation involves forming a mental image, etc, of the elements of a problem or situation while an external representation includes forming a diagram or drawing a sketch to understand or present a problem or situation. While some problems can be solved only through internal representations difficult and complex problems can be solved relatively easily using external representations such as a graph, a table, flow chart, etc. For example, to solve the multiplication of 16 by 25, it might be enough to form a mental image (internal representation) whereas making a decision of buying a house by an employee on loan which involves monthly payment of installment requires rough work on paper (external representation) to ease the difficulty. The skill of representing here refers mainly to external representation.

2.8.1.2 Critical Thinking Skills

While the skills in the Core Thinking Skills category are useful in understanding, organizing, representing, and retrieval of the information, evaluation of such information is out of the scope of that category. Before the discussion of the Critical Thinking Skills, it is important to understand the definition of critical thinking, which helps in the justification of this separate Critical Thinking category.

The concept of critical thinking is quite elusive. One of the important definitions was offered by Edward Glaser (1941): “Critical thinking calls for a persistent effort to examine any belief or supposed form of knowledge in the light of evidence that supports it and the further conclusions to which it tends” (p. 6). Glaser refers to components such as inferences, identifying unstated assumptions, deductive reasoning, drawing conclusions, and evaluating arguments.

In 1962, Robert Ennis attempted to point to the gaps that existed between philosophy and psychology’s treatment of human thinking and conceptualized critical thinking as the correct assessing of statements. He proposed that there were twelve aspects of critical thinking in which the first one is grasping the meaning of a statement and the next twelve involve judging different aspects in the statements.
this earlier conceptualization, Ennis gave much importance to logical reasoning in the formation of critical thought. In this definition, creative thinking was excluded.

This view from the perspective of assessing statements or judging can also be seen in the definitions of other scholars such as Brookfield (1987), as cited in Moon (2008)—"Thinking critically involves our recognizing the assumptions underlying our beliefs and behaviours. It means giving justifications for our ideas and actions. More importantly, perhaps, it means we try to judge the rationality of these justifications" (p. 35).

Broader definition of the term was offered by Ennis (2001) by including the critical thinking dispositions, i.e. intellectual tendencies; and by Facione (1990) as purposeful self-regulatory judgement. According to the comprehensive definition provided by Facione, a critical thinker needs to distinguish opinions from facts, evaluate evidence, and avoid illogical thinking.

However, experts like Beyer (1987) point out that "critical thinking is not to be considered as encompassing all" (p. 32). It is not the same as recall and critical thinking cannot be equated with decision making or problem solving. For Beyer, critical thinking is one of several components of higher-order thinking.

In the earlier conceptualization of critical thinking, it can be observed that there is an exclusion of creative thinking. Even in the more recent Cottrell's (2005) definition, the exclusion of creative thinking and the emphasis of a skill-centered perspective on critical thinking may be observed: Critical thinking involves “working out whether we believe what we see or hear; taking steps to find out whether something is likely to be true; arguing our own case if someone doesn’t believe us” (p. viii).

For Moon (2008) critical thinking includes challenging ideas, developing argument, analysing, evaluating, reflecting, interpreting, appreciating, etc. More recently, Kallet (2014) stresses on the purposive nature of thinking and defines critical thinking as “manual thinking; purposeful; being aware of the popularity of your thinking; a process; and thinking that uses a tool set” (p. 4).

Vaughn (2010) defines thinking as “the systematic evaluation or formulation of beliefs, or statements, by rational standards” (p. 4). According to him, critical
thinking emphasizes "not on what causes a belief, but on whether it is worth believing" (p. 4). He points out that critical thinking complements and perfects creative thinking.

Fisher (2001) included creative thinking in his definition which follows:

Critical thinking is a kind of evaluative thinking which involves both criticism and creative thinking and which is particularly concerned with the quality of reasoning or argument which is presented in support of a belief or a course of action. (Fisher (2001) as cited in Moon, 2008, p. 13)

Similar definitions that include creative thinking can also be seen in the current literature, which show that there exist significant differences between critical and creative thinking.

As we have seen in the above definitions, in the beginning conceptualization of the term critical thinking, evaluation and assessment of the information formed central part of its construct. Though there have been attempts to include creative thinking as a part of critical thinking, it is difficult for an average teacher to consider creativity as a component of critical thinking. Therefore, separate categories are necessary to lay emphasis on critical and creative thinking skills.

Critical thinking entails logic, which is the study of good reasoning. Reasoning is the process of supporting an argument using premises (evidence such as facts, research data) to arrive at valid or invalid conclusions, which are also called logical fallacies. Two types of reasoning are discussed in logical reasoning: inductive and deductive. We reason inductively when we generalize from the specifics and deductively when we begin with a rule, a principle, or a theory and apply it to a specific situation. For instance, James watches Jackie Chan's movie and likes it very much. As the movie is good, he watches another Jackie Chan movie, and another, and then another. He reasons inductively from all the movies he watched and concludes that Jackie Chan movies are good. James, then, uses this conclusion or belief to predict that Jackie Chan's next movie is going to be good. So, the conclusion is applied to a specific movie through deductive reasoning.

Critical thinking skills include analyzing and evaluating. Analyzing arguments needs the knowledge of the terms such as conclusions, premises, statements,
assumptions, counterarguments, qualifiers, etc. These terms have distinct meaning in critical thinking processes.

An argument in critical thinking is different from its meaning in general parlance. It contains a conclusion which is supported by premises. A conclusion takes the form of a claim, a suggestion, or a recommendation, which are the end results of an argument. Identifying conclusions can be relatively easy with the help of the transitional linkers such as therefore, so, thus, for this reason, in conclusion, consequently, accordingly, in summary, as a result, etc.

Premises are the reasons that form the justification for the conclusion. They can be facts (statistical or research data) or opinions. To be called a premise, it need not strongly support the conclusion. The strength and validity of a premise determines the strength of the argument. If the premises are weak, the argument is also weak. Identifying premises can be difficult. However, help can be sought from the linkers such as since, for, as, because, if, for the reason that, and in view of the fact that.

A statement in an argument can be a phrase or sentence whose truth validity is identified. A statement can be a sentence but all sentences are not statements. For example, a command “Drag the chair” is not a statement but a sentence. Similarly, a sentence “She is beautiful” is not a statement because it might be true for some and false for some others. Sentences such as “I like flowers,” “Biryani is delicious,” and “This room is nice” are not statements.

Assumptions are statements that are not supported by any proof or evidence. Mostly, they are implicit in that they are not stated in the arguments. Identifying assumptions is a challenging task since it requires an in-depth knowledge of the issues involved in the argument. Assumptions can expose the strength or validity of the argument. When assumptions are dubious, the line of reasoning is fallacious. One commits logical fallacies in one’s argument. Identifying logical fallacies is essential in judging the validity of an argument. A fallacy, originated from Latin verb fallere (means deception), is an erroneous inference and it is hard to detect. A number of logical fallacies have been explained by many scholars and experts. However, there is no single classification system of logical fallacies exist (Sternberg, Kaufman, Grigorenko, 2008).
Counterarguments are statements refuted by the conclusion in the argument. Identifying counterarguments can enable one to analyze arguments effectively. They need to be constructed very carefully otherwise they might weaken the argument.

Qualifiers limit or constrain the conclusion in an argument. They are statements that explain the conditions under which a conclusion is supported.

The following examples can illustrate the skills discussed above.

James: I was able to climb Ketu mountain. Therefore, I will be able to climb Mount Everest.

In the simple argument given above, “Therefore, I will be able to climb Mount Everest” is the conclusion because James is making a claim about his ability. The reason and evidence, “I was able to climb Ketu mountain”, he used to support his conclusion is called premise. There is an implicit assumption in his conclusion that climbing Mount Everest is the same as climbing Ketu. He commits a logical fallacy of drawing a weak analogy, i.e., assuming that the conditions and abilities required for climbing both the mountains are same.

Evaluating entails many sub-skills which play a significant role in analyzing arguments. Distinguishing between facts and opinions or value claims is necessary to understand the argument accurately, especially its premises. A fact is a verifiable statement based on concrete evidence but an opinion cannot be verified since it reflects one’s emotions. This sub-skill should not be confused with the traditional true/false questions.

Similarly, it is important to distinguish between relevant and irrelevant information to make an effective decision, to define a problem, to evaluate alternatives, etc. Whether a piece of information is relevant or not is highly dependent on the criteria established by the problem solver. One way of evaluating the information for relevance is to identify advantages and disadvantages, which is possible by identifying causes and consequences of an alternative course of action, etc.

Judging the credibility of a source plays a prominent role in ascertaining the veracity of the statistics or research data provided as evidence in support of a claim or an argument. Deep content knowledge is a prerequisite to perform such a skill.
However, this skill can also be taken up for teaching where the world knowledge of the students can be utilized in a task that requires less deep subject knowledge.

The ability to *judge definitions* is more related to language. Deductive reasoning functions in the performance of this skill, where a person must have the ability to apply a definition in several different contexts and evaluate it. Many a time, clarity of the construct of the terms is a crucial issue in precise definition.

### 2.8.1.3 Creative Thinking Skills

As seen in the above definitions, some experts do not see creative thinking as a distinct type of thinking whereas some others maintain a clear distinction between critical and creative thinking. Norris and Ennis (1989), as cited in Brookhart (2010), using four characteristics—reasonableness, productivity, reflectivity, and evaluation—distinguishes creative thinking from critical thinking. First, both creative and critical thinking are reasonable. Second, while critical thinking does not always result in the creation of a conceptual or physical product, creative thinking is always productive. Third, while critical thinking is always reflective and deals with the past only some creative thinking is reflective and distinctly deals with the future. Fourth, while critical thinking is evaluative, creative thinking is non-evaluative or generative.

However, defining creative thinking as non-evaluative has been subject to criticism. Sweller (2009), as cited in Brookhart (2010), see both generation of ideas or products and testing them for effectiveness as aspects of creative thinking. This is justified in view of the first characteristic of Norris and Ennis. If any creative outcome or product must be useful, it has to be tested within the constraints or criteria established, which decides the degree of reasonableness. This characteristic of creative thinking has also been emphasized in Torrance’s classic definition of creative thinking.

Torrance’ (1974), as cited in Puccio and Murdock (2001), definition of creative thinking describes some of the behaviors that are involved in the process of producing a novel solution or outcome:

A process of becoming sensitive to problems, deficiencies, gaps in knowledge, missing elements, and so on; identifying the difficulty; searching for solutions, making guesses, or formulating hypotheses about the deficiencies; testing and
retesting these hypothesis and possibly modifying and retesting them; and finally communicating the results. (p. 68).

Torrance’ definition describes the stages people go through when they engage in creative thinking. This process is supported by the abilities and skills necessary to do what is being described. A comprehensive description of the skills, abilities, and dispositions is provided by Petty (1997), as cited in Moseley, et al. (2005). According to him, the creative process has six phases—inspiration (researching and generating ideas), clarification (focusing on the goals), distillation (deciding on the ideas to work on), incubation (continuing the work with a positive mind), perspiration (working determinedly), and evaluation (reviewing the work and learn from it). These phases are not intended to be mutually exclusive and reflect the fact that creative thinking is a complex and holistic process.

Presseisen (2001) describes creative thinking as a complex thinking process, which involves developing or inventing novel, aesthetic, constructive ideas or products. Hence, it can be understood that creative thinking is a complex process and requires the use of several discrete thinking skills.

Developing criteria is a highly significant ability across the dimensions and categories. This skill acknowledges individual differences in that each student has a unique value system which influences his/her problem solving or decision making. This skill is closely associated with planning. One sets goals and objectives to solve a problem, etc, and simultaneously criteria evolve to help evaluating alternatives, distinguishing between relevant and irrelevant information, etc.

Ability to generate ideas or brainstorm is crucial in helping in developing the number of alternatives, possibilities, and choices. There are many strategies and tools available to help in brainstorming. External representations discussed in the Core Thinking Skills category and Relational Algorithm in the thinking strategies can help a lot in generating new ideas.

One of the distinct skills of creative thinking skills is imagining/visualizing. This ability enhances the skill of brainstorming. By making unusual relationships and connections between the elements involved, one can come up with novel solutions. Imagining should not be considered as an ability that is innate. Observing and
studying the works, inventions, and innovations of great people, one can draw creative analogies between various concepts to create a new one.

Once a problem is defined and the goals and objectives are set, information needs to be gathered. While exploring, one needs to include all the information, whatever extent it is relevant to the current situation task. At this juncture, evaluation of the information should not be done so that the mistake of discarding even a small piece of useful information is avoided. The quality of exploration is strongly influenced by the quality of problem definition. When all factors related to the problem situation are considered from multiple dimensions, exploration would be rich and productive.

It is very naïve to think that any solution comes from a single source of information. After exploring, synthesizing information from various sources takes place. Between these two skills there are various sub-skills such as evaluating the alternatives, distinguishing between relevant and irrelevant information, identifying the advantages and disadvantages, etc would intervene to affect the synthesis and thus the final product. Once a creative solution is arrived at, it is important to predict and anticipate the consequences of the new solution. By doing so, corrective measures can be taken by going back to the previous steps in the creative thinking. It should be noted that the skills listed here as well as in the other categories are so generic that they can be used in multiple contexts and subject domains. For the convenience of articulating the skills, only some generic terms such as problem, solution, concept, etc., were used.

2.8.1.4 Problem Solving Skills

Problem solving is an activity that is encountered in everyday life. In the context of teaching, problem solving skills are taught in order to accomplish two goals: “to improve how students think and to link school-learned knowledge with everyday contexts outside of school” (Lochhead & Zietsman, 2001, p. 54).

Within the curriculum, there are two possible types of problem-solving, viz., “Subject-specific problem solving and General-purpose problem solving” (p.55). Mathematical problem solving is one example of subject-specific problem solving.
Several other fields, such as physics, also have specific literature on discipline-specific approach.

Although there is no universal definition of problem solving, experts agree that its nature is strongly related to context. As such various descriptions of the concept are popular. One such model was offered by Sternberg (2001). According to him, the following *metacomponents* constitute the problem-solving cycle: 1) Defining the nature of a problem 2) Allocating resources to problem solving 3) Representing information about the problem 4) Formulating a strategy for problem solution 5) Monitoring problem solving 6) Evaluating the problem solution.

Sternberg (2001) describes two approaches to the teaching of problem solving—Implicit and explicit teaching and learning. In the implicit approach, the teacher makes no explicit mention of the problem-solving skills. The students learn the skills by using them without being consciously aware of them. The second approach is to teach these skills by deliberately informing the students and expecting them to learn them. Since both the approaches have their own advantages and disadvantages and do not represent mutually exclusive options, “it is possible to maximize the advantages and minimize the disadvantages of both approaches in the teaching of problem-solving processes” (p. 453).

Sternberg (2001) offers a four-pronged model for teaching problem solving, which helps in both the approaches mentioned above. It contains the following procedural steps: 1) Familiarization of the problem solving processes; 2) Intragroup problem solving; 3) Intergroup problem solving; and 4) Individual problem solving.

Beyer (1987) conceptualizes problem solving as a thinking strategy, which contains subordinate operations—1) Recognize a problem 2) Represent the problem 3) Devise/choose a solution 4) Execute the solution 5) Evaluate the solution. While individuals proceed through these steps in general, various operations are repeated until they arrive at a final product.

Under the category of Problem solving, the following skills can be grouped. In everyday life, many a time people are not aware that a problem exists. So, identifying the presence of a problem is also a significant ability. Even an academic situation is not an exception to this. For instance, a student of class VI, able to read 100 words per
minute, usually does not consider that he/she has a problem with reading until he faces a competition in speed reading. Identification of a problem is influenced by one's goals and objectives and it helps in redefining such goals.

Following the identification of the problem, it should be clearly defined. The terms and their meanings, their relationship with the other terms must be clearly laid out. External representations can assist such activity. After this, further analysis of the problem needs to be carried out to prioritize various aspects in the problem. This step includes exploring the causes and estimating the magnitude of the consequences in terms of time, money, and other resources. At this stage, various skills in the other categories are utilized.

Followed by the clear definition or representation of the problem, a plan needs to be chosen or devised to solve the problem. Then, the solution is executed or implemented, which is followed by the evaluation of the solution. This makes the activity of problem solving a cycle, where if the solution is not effective the previous steps are evaluated and a new revised solution might be devised and executed.

2.8.1.5 Decision Making Skills

The importance of the ability to make a good decision cannot be underestimated for it has the most immediate consequences. The magnitude of these consequences depends on various factors such as the number of stakeholders, the level at which the decision is made—individual, institutional, or national level, etc. Unfortunately, people do not generally engage in much decision making thoughtfully. Over the years, cognitive psychologists have studied decision making and found systematic biases and faults in people's decision making process. Halpern (2003) lists a few of them:

- **Failure to seek disconfirming evidence** (seeking information that only agrees with our ideas)
- **Overconfidence** (believing that the current thinking is good enough and unwilling to see the need to improve further)
- *Availability Heuristic* (utilizing readily available information giving in to prejudices and stereotypes)
- *Wishful thinking (Pollyanna principle)* (believing that pleasant events are more likely than unpleasant ones)
- *Entrapment* (continuing with the existing unfavourable situation because of the time and efforts that have already been invested into it)
- *Psychological reactance* (getting influenced by the emotional states arising from restrictions of freedom)
- *Reciprocity of Liking* (liking people who like us)

These pitfalls have the potential to limit the process of effective decision making. Being aware of these faults can help students develop better decision making habits. For many years, thinking and decision making were viewed as skills that normally develop through biological maturation and social interaction. But a number of researchers have concluded that skillful decision making needs to be taught in education given the fact that innumerable alternatives exist in the real world.

Decision making is often considered to be identical to problem solving whereas some experts see decision making as a process that differs considerably from problem solving (Kepner & Trego, 1981). According to Kepner and Trego, decision-making involves selecting from a set of alternatives in the absence of a single objective and correct alternative. It involves parallel assessment of alternatives unlike serial trials of potential solutions in problem solving. It also includes use of qualitative and quantitative criteria in the analysis of alternatives, and emphasis on values in the application of the criteria.

There are several descriptions of decision making process. Beyer (1987) lists the following procedural components in the process: 1) Define the goal  2) Identify alternatives  3) Analyze alternatives  4) Rank alternatives  5) Judge highest-ranked alternatives  6) Choose the best alternative(s).

Important aspects in the above process are generating, analyzing and evaluating alternatives. “Alternatives that have been generated must be analyzed in terms of relevant criteria” and be “ranked how well they meet this criteria” (p. 29).
The following skills are listed under the category of *Decision-making skills*. Of these, the first step is *defining the goal or objective*, which entails identifying the gap between the existing and desired conditions, and considering various optional goals. This is followed by *generating alternative* courses of action. Alternatives thus generated must be analyzed using the relevant criteria established for the purpose. The advantages and disadvantages of each alternative may be listed to assess the worth of each of them. One might rank order the alternatives to *choose the best alternative*.

### 2.8.1.6 Thinking Strategies

As has been mentioned earlier that the purpose of compiling the skills, strategies, and dispositions is to assist teachers in understanding, designing materials, and assessing teaching thinking, *thinking strategies* is listed as a separate category to emphasize the importance of the strategies also. In spite of the fine distinctions and overlapping meaning of skills and strategies, both of them are associated with procedural knowledge. A thinking strategy, here, refers to *the conscious use of a plan to perform a cognitive task with relative ease*. Thinking strategies are related to both metacognitive as well as cognitive skills sub-dimensions because cognitive and metacognitive strategies can be found under this category. Nonetheless, the distinction between cognitive and metacognitive strategies fades in the context of explicit teaching, in which case it is essentially metacognitive in nature. A comprehensive review of various thinking strategies was provided in preceding sections of this chapter. While some of them are being used by the language teachers, others can also be tried out. In addition to these, there are innumerable number of techniques and strategies in cognitive psychology and neurosciences. Exploration in depth is required to bring them to the English language teaching.

It is common for people to justify their opinions rather than seeking counterevidence and educate themselves. In such process, they might commit a number of thinking errors, which are called *logical fallacies*. Though there are many of them in the literature, little work has been done with regard to the pedagogy of how to overcome such fallacious reasoning. Various emerging fields in neurosciences and brain studies such as neuro-linguistic programming should be explored to evolve...
strategies, heuristics and algorithms to enable students to tackle such fallacious reasoning.

Heuristics and algorithms are also a part of thinking strategies. A heuristic is a rule of thumb applied to help increase the probability of solving the problem whereas an algorithm is a procedure that always yields a correct answer if one follows it exactly (Halpern, 2003). An example of an algorithm is a recipe for a dish. If the steps in the recipe are followed, the result should always be the same. But if the cook add salt in the dish by guessing rather than measuring it, then a heuristic is being applied. The value of heuristics cannot be undermined since the effectiveness of a heuristic can be established when it is put to rigorous test. Furthermore, using well established heuristics, one can obtain valuable insights into creating one's own heuristics.

2.8.2 Metacognitive Thinking Skills

Bruner (1996) reminds us that the learner has the capability of thinking about his/her own thinking in terms of correcting the ideas by reflecting, by “going meta” (p. 57). Statt (1998) defines metacognition as “having knowledge or awareness of one’s own cognitive processes” (p. 86).

Teaching for metacognition is important because “it affects acquisition, comprehension, retention and application of what is learned, in addition to affecting learning efficiency, critical thinking, and problem solving. Metacognitive awareness enables control or self-regulation over thinking and learning processes and products” (Hartman, 1998, p. 1).

Metacognition was originally described by Flavell (1978), as cited in Wilson (1985), as the knowledge about and regulation of one's cognitive activities and learning processes. He defined it as “knowledge and control of one’s own cognitive processes” and “knowledge and cognition about cognitive phenomenon.” According to Flavell, Metacognition entails, metacognitive knowledge (knowledge about person, task, and strategy), metacognitive skills (monitoring and regulating cognitive process), and metacognitive experiences (feelings that emerge out of an ongoing experience).
should be noted that “his description of the skill component is limited to monitoring and relating aspects of metacognitive activities” (Boekaerts, 1999, p. 573) but not planning. However, An 1 Brown emphasizes on planning, monitoring, and revising (Marzano, 1988).

Many other experts defined metacognition using different terms such as self-regulation, self-awareness, metacomprehension, metamemory, etc.

Sternberg (1984, p. 8) defines metacognitive thinking as “executive processes that one uses to plan what one is going to do, monitor what one is doing, and evaluate what one has done.” Accordingly, cognitive processes are performance components for thinking and meta-components decide what performance components should do.

The term self-regulation is a bit controversial among researchers and it has been described in two ways. Some researchers consider self-regulation as a subordinate component in metacognition while others consider it as a super-ordinate term.

Another useful conceptualization was made by Nelson (1996), as cited in Veenman, et. al. (2006), distinguished between two levels to conceptualize metacognition: object-level and meta-level to describe both cognitive and metacognitive processes. According to him, object-level is the level at which the cognitive processes take place whereas meta-level controls the object-level. Two ways of information flow take place between the two levels: monitoring processes that convey information from object-level to meta-level and controlling processes that operate and govern the activity taking place at object-level through instructions. This distinction is helpful in the explicit instruction of metacognition because it aids in achieving greater precision in designing tasks.

Moreover, the concept of metacognition can be easily understood by drawing a parallel with “Blue hat thinking” in Edward de Bono’s (1993) Six Thinking Hats. When one wears a blue hat, one controls, regulates and monitors the use of other hats and thus the whole cognitive processes.

The concept of metacognition poses a challenge to cognitive frameworks since it has references to affective domain too. As in Flavell’s description, metacognitive experiences are the feelings that can activate and can be elicited by metacognitive skills (Boekaerts, 1999). Given the nexus that can be established by metacognition
between cognitive and affective domains, even most widely used frameworks such as Bloom's, including the revised version by Anderson, et al., (2001) and others, could not fully include the components of metacognition into their framework for the obvious reason that the taxonomy was a cognitive framework.

The treatment of metacognition in this list needs to be noted. Under the skills dimension, metacognitive skills are listed where the disposition to be metacognitive appears under dispositions dimensions. Since dispositions are also related to affective domain, metacognitive experiences can be captured under dispositions dimension.

Metacognitive knowledge, one of the types of knowledge, doesn’t figure in the list because the objective of preparing the list is not to account for all types of knowledge and learning and it is not a taxonomy of educational objectives. The list is expected to aid the teachers of ESL curriculum in knowing and understanding various thinking skills and dispositions that can be taught to develop thinking among students. Nevertheless, the importance of various types of knowledge, to any extent, is not undermined. The interplay between declarative, procedural, conditional, metacognitive knowledge types, and thinking skills and dispositions are well acknowledged in this study. The discussion of these types of knowledge will be dealt in the later sections in this chapter.

Therefore, under the sub-dimension of metacognitive skills, the following skills and sub-skills are discussed.

2.8.2.1 Planning

Planning begins with setting or stating the goals and objectives of a cognitive activity. It is also important to establish the sub-goals for better assessment. After stating what needs to be accomplished one has to select or choose appropriate thinking skills or operations, which is followed by planning the sequence of operations and skills to be used in the performance of a task. As a part of planning, identifying potential obstacles in the execution of the plan may be anticipated to identify ways to cope with such difficulties. Various thinking strategies used by experts and successful people might be planned to be used as and when the anticipated necessity arises.
2.8.2.2 Monitoring

Monitoring here includes both observing, controlling and regulation of cognitive activity. While executing the plan thus devised, one continually checks and monitors the effectiveness of one’s thinking processes. At every terminable stage and sub-stage in the performance of a task, the extent of achievement of a goal/sub-goal is observed. This sub-skill helps in deciding the next cognitive operation to be implemented. At all stages of task performance, one needs to be alert and cautious to the obstacles and pitfalls and use appropriate strategy to overcome such problems. In this process, one requires patience and willingness to be metacognitive to achieve effectiveness in thinking processes.

2.8.2.3 Evaluating

The final skill, evaluating, includes assessing cognitive processes and their product against the set objectives or goals. Having finished a thinking task, one needs to assess the quality of the product in terms of its reasonableness and accuracy. The product could be a decision, a solution, a resolution, etc. The quality of the cognitive processes/procedures is also evaluated to help improve metacognitive abilities in further cognitive activity. This might also help in learning new strategies for improvement.

A significant sub-skill in evaluation is the assessment of handling the obstacles, which is partly to do with the use of effective strategies. Reflecting on the obstacles determines how well they were anticipated and dealt. This might give leads to thinking of alternative ways of tackling those obstacles. Finally, one judges the overall efficacy of the plan and its execution and makes changes to the plan for future use in comparable situations.

2.8.3 Dispositions

Good thinkers certainly have thinking skills. But they also have motivations, attitudes, values and habits of mind all of which play key roles in good thinking. It is these elements that determine whether people use their thinking skills when it counts.
In an effort to account for the affective and attitudinal dimension of high-level thinking, many scholars and educators involved in the thinking skills movement have urged attention to what are often called "thinking dispositions." The importance of teaching thinking dispositions is captured in Ritchart (2002):

If the candidate disposition is something whose value can only be determined situationally, it becomes more of a heuristic or useful back-pocket strategy than a thinking disposition.

Since willingness is necessary to perform cognitive activity, which is effortful, teaching for the development of thinking without aiming at inculcating thinking dispositions is a mere teaching of a set of strategies and heuristics.

Broadly defined, thinking dispositions are tendencies toward particular patterns of intellectual behavior. In an effort to identify the nature of these patterns of thinking, several scholars and educators have proposed more precise definitions. The philosopher of education Robert Ennis, who has been involved in the thinking skills movement since its beginning, has long recognized the importance of critical thinking dispositions (Ennis, 1962). Following the philosophical tradition, Ennis defines a thinking disposition as a tendency to do something given certain conditions. Ennis argues, however, that in order to qualify as a thinking disposition, the disposition must be exercised reflectively. In other words, given the appropriate conditions, dispositions are not automatic (Ennis, 1996). Stephen Norris, another philosopher of education concerned with critical thinking dispositions, also defines a thinking disposition as a tendency to think in a certain way under certain circumstances (Norris, 1992). In Norris' view, a thinking disposition is not simply a desire or predilection to thinking critically. He says, "...individuals must either have formed habits to use certain abilities, or overtly think and choose to use the abilities they possess. A person with an ability to think critically under certain conditions will do it, only if so disposed" (Norris, 1992).

Most of the above definitions follow the everyday usage of the term disposition, which contrasts with the notion of ability. Thus, as Norris suggests, one can have an ability to do something — for example, the ability to seek balanced reasons in an argument — but not be disposed to do so. Following this everyday usage,
one can say that good critical thinkers have critical thinking abilities and critical thinking dispositions. In other words, the critical thinker who seeks balanced reasons in an argument has both the ability and the disposition to do so.

It is clear that thinking abilities and dispositions influence each other though the correlation between them is yet to be researched (Facione & Facione, 1993). In the preceding sections, a few frameworks for thinking dispositions were provided. Some of those lists are titled as critical thinking dispositions. On closer observation, it can be understood that some of the dispositions in those lists are more related to creative thinking and metacognition. In view of this fact, it is better to use a more generic term thinking dispositions than just critical thinking dispositions. Ritchart's (2002) classification of the dispositions into three categories—creative thinking (looking out, up, around, and about), reflective thinking (looking within), critical thinking (looking at, through, and in between)—also supports the use of the term thinking dispositions.

The following dispositions fall under the dimension of dispositions,

2.8.3.1 Inquisitiveness

Inquisitiveness means curiosity, which prompts us to explore and probe the world. An abiding tendency to be curious into affairs is foundational to many thinking skills such as generating ideas, exploring alternatives, etc. It is not so uncommon to find people among us who make decisions without gathering information to the fullest extent assuming that the information available is enough and correct. Such a pitfall is called availability heuristic (Halpern, 2003). One needs to seek for disconfirming evidence and try to be well informed in order to solve problems and make decisions effectively.

2.8.3.2 Open-mindedness

The opposite of open-minded is narrow and rigid, which are very common obstacles to effective thinking. This disposition is so pervasive that it determines the quality of various thinking capabilities. In a policy-making meeting, if the head of an organization is not willing to consider multiple points of view of the members, it could
be seriously detrimental to the interests of the firm. As Edward de Bono (1993) cautions, through the concept of *Lateral Thinking* and *Six Thinking Hats*, that at the time of generation of ideas, only generation should happen. On the contrary, if an idea generated is immediately evaluated, there is a danger of discarding a good idea or insight. Thus the disposition to try to consider even seemingly implausible alternatives can yield creative solution. But such disposition is influenced by willingness to take intellectual risks. Risk-taking here does not mean that one should neglect the goals and objectives established, rather one should try to be broad-minded and responsibly adventurous.

**2.8.3.3 Orderliness**

Willing to be planful and strategic is, in fact, an engine for applying all thinking abilities. Letting situations go as they naturally do will not let people achieve their goals and objectives. Given the multiplicity of possibilities, choices, causes, and consequences, in the light of struggle for survival within the constraints posed by the society and individual abilities, being planful and strategic is essential and expected of every individual. Such a tendency can help in maintaining focus without losing the sight of the criteria, goals, and the progress of an intellectual activity. Utilizing cognitive resources effectively is also a skill, which can be enhanced by the disposition to be orderly.

**2.8.3.4 Analyticity**

*Analyticity* refers to the inclination to seek, offer, and evaluate reasons and to seek clarity about intended meanings. Though the abilities related to this disposition appeared in critical thinking skills, the willingness to use the abilities should be given recognition. One's disposition to ask, offer, and assess the worth of reasons and consequences determines the quality of problem-solving and decision-making.

Clarity of thought is dependent, to some extent, on the language used to define the problem or situation that demands thinking. In such case, the meaning intended in the use of each and every word in the key statements can influence the direction of the thought processes. It also helps in distinguishing between relevant and irrelevant thoughts and information.
2.8.3.5 **Truth-seeking**

Truth is not offered to us, but it is only uncovered through our direct and indirect experiences. Reasoning helps seek the truth through the clutter of information colored because of vested interests of the people involved in its generation. However, disposition towards understanding reality is difficult to inculcate among children. In most cases, experience suggests that people have different opinions about the same issue. Each of the opinions seems to be true from his/her perspective. However, if one is not able to justify and provide reasons or seek and offer evidence for one’s opinion, the search for truth does not take place. To seek truth one must have the ability and willingness to withhold one’s opinions and judgment as possible and probable in order to understand the real nature of the truth.

We can observe here, that the disposition of seeking truth necessitates the ability to consider multiple points of view, which in turn is dependent on one’s willingness to withhold one’s judgment. This suggests the interdependent relationship between thinking dispositions and thinking skills.

2.8.3.6 **Metacognition**

It is not surprising that most adults are not aware of their beliefs and levels of knowledge for they are transient. With every experience, one learns and unlearns, knowledge is added, erased, and modified as a result of which beliefs are also subject to change. To be aware of one’s beliefs and knowledge for a specific period of time does not help in effective thinking. Further, it does not guarantee that if one possesses critical and creative thinking abilities, one must also be willing to use them in their lives. These dispositions need to be enduring. For that matter, to make decisions and solve problems effectively, and lead a fulfilling personal and professional life, all the thinking dispositions must be present continually in all human endeavors.

Having discussed the list of thinking skills and dispositions, it is important to understand the concept of transfer, which forms the strong justification for teaching of thinking skills and dispositions mentioned above. It is argued here that teaching thinking skills and dispositions can lead to transfer to subject areas and everyday life.
2.9 Transfer of thinking skills.

Transfer means carrying over previous learning to new situations. The objective of teaching thinking is to enable students use thinking skills and strategies in a wide variety of contexts. When we ask students to read prose such as *Great Expectations*, we expect them to carry over those language skills to read a wide variety of texts in newspapers, job applications, instructions in catalogues, etc., not just reading and understanding only that piece of prose. In fact, *transfer of learning*, i.e., skills and knowledge, is one of the central objectives of the education process—

One hopes that students will become better creative and critical thinkers in the many contexts that invite a thoughtful approach, such as making important life decisions, casting votes, interacting with other equitably, engaging in productive pursuits such as essay writing, and painting (Perkins & Salomon, 2001, p. 370).

While transfer of content-area learning is a highly debated and discussed, our discussion centres around the transfer of thinking skills. Haskell (2001) discusses various overlapping types of transfer:

- **Content-to-content** or **Declarative-to-declarative** (Content knowledge in one area helps in learning another content area)
- **Procedural-to-procedural** (learning skills in one area help in another skill area)
- **Declarative-to-procedural** (learning about something helps in learning a skill)
- **Procedural-to-declarative** (skill learnt helps in learning content)
- **Strategic** (learning of one strategy helps in learning another strategy-learning)
- **Conditional** (knowledge of conditions of application transfer to a new context)
- **Theoretical** (transfer of underlying structures to another context)
- **Nonspecific** (previous general knowledge transfers to new situations)
- **Literal** (direct use of knowledge in a new context)
- **Vertical** (prior learning transfers to a level above in knowledge hierarchy)
- **Lateral** (prior learning transfers to the same level in hierarchy)
- **Proportional** (abstract transfer)
- **Relational** (seeing the same structure between two things)
Haskell (2001, p. XV) provides 11 principles that are essential for transfer to occur, where students need to

1. have a large primary knowledge in the area where transfer is to occur;
2. possess knowledge base outside primary area;
3. the history of the subject area where transfer is required;
4. understand the theoretical knowledge underlying the transfer area;
5. understand the nature and function of transfer;
6. have the *spirit of transfer*;
7. think and encode learning in transfer terms;
8. be provided with a transfer-conducive culture;
9. have intensive practice;
10. be given sufficient time to focus on transfer;
11. read, understand and observe the exemplars of transfer thinking.

In the principles mentioned above, the first four emphasize on the knowledge required in the source and object areas. The next four highlight the necessity of understanding what is transfer, how it works, how important it is, and the kind of learning that makes transfer possible. The ninth and the tenth principles underscore the allocation of sufficient time for practice and gestation. The last principle identifies the necessity to understand how transfer takes place in real life situation through the lives of people who demonstrated transfer of thinking.

As for the knowledge prerequisite, its due importance is acknowledged in teaching thinking skills in the current study. The primary knowledge base of the target area, as emphasized in some principles above, was presumed and materials were designed. However, it should not be misunderstood that knowledge is related to only academic subjects. Learners’ world knowledge can also be utilized as a base for teaching thinking skills. For instance, a student’s thinking that he got first rank in the exams because of his placing of the hall-ticket at the feet of Lord Venkateswara is based on his/her belief system grounded in his learning and knowledge, to any extent, outside the academic subject domains. So, it is possible to teach thinking skills using world knowledge, in which case transfer might occur in everyday contexts.
A major problem of teaching thinking skills related to the knowledge domain is that the thinking skill learnt in a specific context or situation, where knowledge related to specific domains (politics, psychology, etc) needs to be utilized in most cases, must be recognized by the student as necessary in a novel context. So this problem of recognizing the necessity of performing a skill in a novel situation is assisted by memory through the cues in the content. But “[a]s is known from cognitive psychology, what gets remembered at retrieval heavily depends on what occurred during learning” (Halpern, 1998, p. 453). As a result, information related to the material used for learning needs to have retrieval clues that can be used later. Halpern (1998) suggests “when one is teaching for transfer of thinking skills, one should ensure that the structural aspects of problems and arguments are made salient so that they can function as retrieval cues” (p. 453).

The transfer of thinking skills taught in the ESL curriculum to other academic content areas is a highly debatable topic. It is argued here that teaching thinking (skills and dispositions) as a distinct component in the ESL curriculum can help improve the probability of transfer across content areas also because language is central to academic learning and it is an indispensable tool for knowledge acquisition. Suhor (1984) explains this notion succinctly.

Oddly, though, specialists often overlook the fact that in school settings, language is essential to all kinds of learning. Teachers and students use language in order to understand other symbol systems, from physical education to geography to calculus. Musicians and artists use language to articulate their intentions and discuss their techniques. Students and teachers alike use language to describe their cognitive and affective responses to poems, computer programs or dissected frogs. (p. 92)

That teaching thinking can be a solution to the transfer problem was also clearly stressed by Dewey (1933).

Similar qualities are always the bridge over which the mind passes in going from a former experience to a new one. Now thinking... is a process of grasping in a conscious way the common elements. It thus adds greatly to the availability of common elements for purposes of transfer. [Therefore] thinking is precisely the factor that makes transfer possible and that brings it under control. (p. 67)
The common elements in the Dewey's comments above are the underlying structural characteristics of the learning material. The argument that thinking skills can transfer across domains is summed up by Halpern (1998)—

When critical thinking skills are taught so that they transfer appropriately and spontaneously, students learn to actively focus on the structure of problems or arguments so the underlying characteristics become salient, instead of the domain-specific surface characteristics. (p. 453)

Besides, ESL curriculum can accommodate themes, topics, texts, etc. from various fields, and genre: with varying degrees of complexity of thought. Therefore, the argument that teaching thinking needs some content does not arise. Furthermore, since the content taken for teaching thinking skills in the ESL curriculum is from all kinds of texts from different subject domains, there is an opportunity for the teacher to discuss the applicability of thinking skills across subject domains. Since thinking skills and dispositions are discussed in the classroom, as proposed here, in its generic sense, it is possible for the student to carry over these skills and dispositions to other content areas too.

A virtue of the list of components of thinking delineated in the study contains dispositions. A profound aspect in the argument whether thinking skills are generalizable or not is not completely applied to the study because the study does not consider only thinking skills and strategies. Instead, it also aims at more enduring dispositions, which are at the heart of teaching thinking—

In fact, as long as we emphasize the transmission of skills in the teaching of critical thinking, we will continue to formulate the problem of transfer as the problem of how to get students to transfer their thinking skills to new contexts. A concept of critical thinking as transfer, on the other hand, calls attention to the fact that teaching for transfer is less a matter of transmitting knowledge, skills, strategies, and principles of thinking (though it is that, too) than it is of fostering in students from the start an inquiring disposition (Breil 1990, p. 66)

While it is argued here that teaching thinking in the ESL curriculum can address the problem of transfer, it should not be misread that such teaching is a
sufficient condition for transfer to take place but has the potential to address the problem of transfer to some extent at the least.

2.10 The language of thinking

Teaching thinking predominantly involves the use of certain linguistic terms to refer to the cognitive activity. The term *think* covers a wide range of mental operations. For that matter, teaching and learning are linguistic phenomena to a large extent. It follows that teachers can use language to access and develop the thinking processes of students. English language teachers, since they teach language, are relatively more sensitive to the language used by the learners, which helps them to understand their cognitive processes better.

Neuro-linguistic Programming (NLP), which explores how our thoughts are influenced by words, utilizes language as a tool for accessing the mental processes of people and modifies the language label-experience mismatch by offering appropriate labels for thoughts. The studies in NLP have laid out how words mediate individual and collective cognition and the necessity to be sensitive to the language to understand thoughts of others through three possible misunderstandings caused by language use (O'Connor, 2001, p. 132):

1. We translate our experience into language and mistake the language for the experience when it is only an incomplete reflection. We may think our experience is constructed in the same way as the language we use to talk about it and act inside those limits. We allow the words to limit us. The words bar us from wider choice, action and understanding.

2. We may mistakenly assume that others share our assumptions and so we leave out vital parts of our message. This will confuse other people, even though we do not mean to mislead them.

3. We misunderstand others because we fill in the gaps in their words from our map of reality, rather than finding out their map. We wrongly think that because we share the same language, we also share the same experience. We may then draw the wrong conclusions.
We have seen the importance of strategic use of language in the classroom to enhance cognitive development. But how should teachers go about in using such language of thinking is an important question.

Olson and Astington (1990) suggest that consistent use of language of thinking in everyday classroom interactions helps in storing and retrieving specific skill procedures. For instance, using the word *evaluate* rather than *tell me what you think about it*, and words such as *alternatives* and *options* can help them access specific procedures in the process of decision making (Astington & Olson, 1990).

Costa & Marzano (2001) explain some strategies to help teachers use the language of thinking.

- **Specific Vocabulary.** Teachers should use specific cognitive terminology to demonstrate how thinking skills are performed, e.g., “Now find out the premises, assumptions, conclusions”. When such language is used daily in the classroom, students internalize those words and phrases and can apply these words in other subject areas too.

- **Using critical questions.** Teachers generally have the privilege of encouraging or discouraging specific behaviours of students in the classroom. They can use language to establish a thinking culture in the classroom.

- **Data instead of solutions.** Teachers can make children responsible for their behaviours by letting them understand the consequences of such behaviours. When the teacher says, “I want you to know that your finger tapping on the desk is disturbing me.” instead of saying “stop that noise,” they become aware of the effects of their behavior on others. This helps them see the situation from other’s perspective.

- **Probing for specificity.** Teachers need to be cautious of vague terms such as *always, never, all, everybody*. When students use such words, teachers can prompt them to think more specifically by asking questions such as “Never? Never, ever?” “Everyone, who exactly?”
• Developing metacognition. When teachers ask their students to metacogitate, to describe their thought processes, students become aware of their thinking process. Teachers can notice their words and other features of language and understand their thought process and look for any mismatch between their words and thinking behavior. They can, then, help them with appropriate labels to support their thought processes.

• The logic of language. Certain words in English indicate logical relationship between ideas, which might be called linguistic cues (and, but, therefore, however, etc). Through these cues, students can be sensitized to rhetorical functions such as comparing, causality, sequencing, etc.

While English language has a wide repertoire of words and expressions that can be used to enhance cognitive development of students, teachers might also coin new words and use nonverbal cues to stimulate students’ thinking since only language is not sufficient to represent the fullness of thought.

To use the language of thinking in the classroom, teachers need to seize several opportunities in the classroom. In addition to the strategic use of language, teachers need to play different roles in order to develop thinking skills and dispositions.

2.11 The roles of the thinking teacher

Nickerson (1988) points out “In the long run, how successful institutionalized education will be in incorporating effective teaching of thinking in the typical classroom will depend to no small degree on how much emphasis teacher-training programs put on the thinking in their curricula” (p. 6). While this statement was made years ago, the teachers’ knowledge of how to develop thinking skills and dispositions is still in question. Waters (2006) rightly recognizes the lack of awareness among teachers about how to teach thinking skills through ELT activities. Teachers need to know about thinking skills and dispositions and their procedural components. They should be equipped with different kinds of methodology that can be adopted in the explicit teaching of cognitive and metacognitive processes. Hence, teacher preparation is an important determinant of success in teaching thinking skills and
dispositions. There are multiple roles that a teacher has to perform in teaching thinking (Wilson & Wing Jan, 2008)

- **Questioner and challenger.** Teachers should use questioning skillfully to stimulate students' thinking while encouraging them to ask questions. Students should be presented with challenging activities and tasks that increases their motivation levels.

- **Model and Coach.** Teachers should take up the responsibility of modeling the thinking processes and make thinking visible through tools such as graphic organizers. They need to model the thinking skills and strategies through revealing to the students the underlying structures, elements, and characteristics of the information in the learning material so that they can transfer the skills to novel situations. They should facilitate the classroom atmosphere that is conducive to student thinking.

- **Strategic planner.** Since teaching thinking skills and dispositions involves the use of multimodal texts and input, and eclectic approaches, teachers need to sequence the tasks and activities very skillfully that each skill or strategy helps in the learning of the next skill or strategy.

- **Assessor.** As assessors, teachers of thinking need to understand the prior knowledge and interest levels of the students. Further they should be able to reflect on their own practice with open-mindedness. The students need to be informed the criteria behind the assessment. As far as possible, the students should also be given opportunities to assess themselves.

As an assessor, a teacher needs to have awareness of various types of assessment systems and instruments.

### 2.12 Assessing teaching thinking

It is relatively simple to assess factual knowledge and simple skills through the traditional assessment formats such as fill in the blanks, short answers, true or false, etc. But assessing thinking is challenging and complex since recognizing the development in thinking skills and dispositions is assessing an abstract construct. As a result, it is important that teachers establish indicators of improvement in thinking.
Costa (1985) discusses ten characteristics of development of thinking skills and dispositions among students.

- **Perseverance** (trying until thinking goal is achieved)
- **Decreased impulsiveness** (thinking after careful consideration of various aspects)
- **Flexible thinking** (adapting one's thinking as necessary)
- **Metacognition** (demonstrating ability to articulate thinking processes)
- **Careful review** (reviewing school work in terms of the criteria given)
- **Problem posing** (posing questions showing an inquiring attitude)
- **Use of past knowledge** (using past knowledge and experience into learning)
- **Transference beyond the learning situation**
- **Precise language** (using accurate language to express ideas)
- **Enjoyment of problem solving** (showing enthusiasm to solve problems)

From the above indicators, it becomes clear that to assess thinking, a variety of assessment types are required.

### 2.12.1 Interviews

By creating an atmosphere of trust and through well-designed questions, teachers can help students reveal their mental processes and their "habits of mind" (Costa and Kallick, 2001, p. 522). Interviews provide teachers with opportunities not only to assess student development in thinking skills and dispositions but also "to model their own use of precise language, their own listening with understanding and empathy, and their own use of questioning strategies" (p 522). This helps students develop their listening and speaking skills also since the teacher provides appropriate language that labels mental processes. Therefore, informal interviews may be considered not only an assessment tool but also a teaching strategy for the development of thinking skills.

Costa & Kallick (2001) suggest that when the students are provided with the opportunity of interviewing one another, it serves in reinforcing their development and
makes them more conscious about their thinking processes. Gradually, this may also lead "students to the use of a powerful strategy: self-interview" (p. 522).

### 2.12.2 Portfolios

A portfolio is a collection of students' work that demonstrates growth over a specific period of time. A portfolio is usually sectioned with folders and labeled depending on the criteria developed. Students choose pieces among their work to be included in the portfolio that demonstrate the growth. On the one hand, these are useful in the assessment process; on the other hand, it provides an excellent opportunity for students to reflect on their work. This happens more intensely when they are asked to justify the inclusion of a specific piece in the portfolio. This reflection on the work done facilitates development of thinking in a systematic way, which has also been underscored by Dewey (1938):

> Keeping track [of ideas, activities, and observed sequences] is a matter of reflective review and summarizing, in which there is both discrimination and record of the significant features of a developing experience.....It is the heart of intellectual organization and of the disciplined mind. (p. 87).

By the end of the specific period allotted for the portfolios, the students can demonstrate their development and can articulate the same. The teacher may assess students' work based on the set of criteria developed for the purpose.

### 2.12.3 Journals and logs

Journals and learning logs have the potential to reveal not just higher-order thinking skills but also the intellectual tendencies of the students. Through these tools, students are provided with great opportunities to engage in metacognition. These inform the teachers about various developmental aspects of students such as content, process, and personal feelings. These may be used at the end of a lesson, a unit or a project. "Teachers too, can join in by reflecting on their teaching, analyzing students' learning, preserving anecdotes about the class interactions, and projecting ideas for how they might approach a unit of study differently in the future" (Costa and Kallick, 2001, p. 522).
2.12.4 Performance assessments

Performance assessments are designed to judge students' abilities to use knowledge and apply it in a real-life problem-solving or decision-making situation. Performance assessments require students to organize, analyse, and synthesize the information in view of a goal. Performance tasks may require students to work individually or collaboratively. These tasks are generally designed based on a set of criteria, which depends on various factors such as purpose, content, modality, etc. However, Popham (1999), as cited in Burke (2001), mentioned seven important evaluative criteria when judging tasks for performance assessments: Generalizability (Will the task generalize to comparable tasks?); Authenticity (Is it similar to real-life situation?); Multiple foci (Does it measure multiple instructional outcomes?); Teachability (Does it improve students' ability?); Fairness (Is it fair and unbiased to all students?); Feasibility (Is it effective in terms of cost, space, time, and other resources?); and Scorability (Can it be reliably and accurately evaluated?).

Once performance tasks are designed, teachers need to decide whether to comment on the work or to score it. In the case of scoring decision, they may resort to the creation of two types of rubrics: analytic and holistic. Generally, analytic rubrics are often used in the scoring of performance assessments. The labels in the rubrics need to be laid out in such a way that the quality of student thinking is captured appropriately in at least one of the rubric trait scales (Brookhart, 2010).

Creating authentic performance assessment can become a highly useful tool for assessing and developing thinking skills among students.

2.12.5 Questionnaires

Brown (2001) defines a questionnaire as any written instrument that presents "respondents with a series of questions or statements to which they are to react either by writing out their answers or selecting from among existing answers" (p. 6). Questionnaires can yield three types of data (Dorney, 2008):

- **Factual** (demographic factors)
- **Behavioural** (life styles, habits, etc)
- **Attitudinal data** (attitudes, opinions, beliefs, values, and interests)
Questionnaires are an important tool in assessing teaching thinking, especially dispositions. In addition to these three types mentioned above, data about students’ metacognitive processes can also be collected through questionnaires.

Though thinking skills and abilities can be assessed through performance based tests relatively effectively, questionnaires can help in assessing thinking dispositions. For there are very few tools to evaluate dispositions, questionnaires can come to rescue, at least to some extent.

2.12.6 Multiple-choice questions

While constructed responses in performance assessments can tap various kinds of thinking skills, abilities, and dispositions, multiple choice formats cannot be totally undermined. If designed with care and caution, multiple choice items can capture thinking skills. Beyer (2001) suggests the direct assessment of thinking skills for which he offers a format of having three levels of performance. The basic premise is that if we want to find out how well a student is proficient in a thinking skill, we need to ask them to report what they know about the skill and how they carry it out. Such direct evidence reveals false moves in executing thinking skills. Beyer emphasized much about thinking skills as far as the assessment is concerned, however, multiple choice format can also be used as one of the tools to assess thinking skills.

True/False questions are also possible (Beyer, 2001)—a sample is given below.

Tell me if each of these people is sorting:

1) My friend figuring which tree is taller       yes/no
2) My brother putting dishes away in the cupboard     yes/no
3) My sister choosing which TV show to watch       yes/no

Fisher (2001), as cited in Moon (2008), argues that multiple choice items provide the examiner only with the option but not with student’s thinking. Moreover, even when the student marks the right choice it might be a guess. He discusses multiple-rating as an alternative to multiple choice items, where it is hybrid item of multiple-choice and constructed-response. He believes that construction of multiple-rating items is easy.
For example a multiple-rating item involves a small reading passage followed by requiring the students to construct a response that strengthens or weakens (or any other criteria) using no more than 20 (or 50) words. A variant of this is giving the students several options (5 or 6), based on a passage, and rate each one of them on a given scale. (Strongly agrees, strongly disagree, etc.)

2.13 Conclusion

In the above sections, the theoretical underpinnings of teaching thinking were provided. Based on various theoretical frameworks, a list of thinking skills and dispositions was also offered for the purposes of teaching and assessment. While the list is made as comprehensive as possible, it is not an end in itself, and can change depending on the student needs that arise from time to time. Regarding the components of the list, the terms used in the list to describe thinking skills and dispositions were taken from a few frameworks and taxonomies. Great care has been taken in reviewing the literature with respect to these categories and justification has also been given for such inclusion. Terms such as critical thinking, creative thinking, problem solving, and decision making have been defined by many scholars and practitioners. These concepts have been reviewed as thoroughly as possible to give general descriptions.

Further, a few popular thinking strategies were also reviewed to demonstrate the possibility of teaching thinking. Some of these strategies are also used in the current study. For instance, graphic organizers are used to help students represent the information given. KWL strategy is used to induct students into metacognitive thinking. Similarly, Socratic dialogue method is used in teaching skills such as identifying conclusions, premises, and assumptions. This method was also useful when the skills were complex and therefore difficult to be explained.

On closer observation of the review of literature, it becomes clear that teaching thinking has attracted very few research studies from the field of language education. This brings the fact to light that teaching thinking, on the one hand, is developing as an independent body of knowledge and research; on the other hand, academic disciplines have been viewed from the perspective of developing thinking skills. In
this context, the study attempts to justify the inclusion of teaching thinking skills and dispositions in the ESL curriculum given the present emphasis on communicative competence only.