CHAPTER 2

REVIEW OF LITERATURE

This chapter is devoted to review the literature so as to look into the philosophical basis of the study. The studies done in the field of thinking have been reviewed along with studies on lateral thinking so as to frame hypotheses. The basic assumption behind collecting these studies was that lateral thinking just like other types of thinking is a skill and can be improved by providing suitable environment. Therefore only those studies have been reported here that comply with the said assumptions.

Helping students to become more effective thinkers is a fundamental goal in education. A fundamental review of the goals of education was therefore undertaken by the Ministry of Education in Singapore, with far reaching implications for curriculum and assessment, as delineated in the document "The Desired Outcomes of Education." A broad, general finding from the research base is that nearly all of the thinking skills programs and practices investigated were found to make a positive difference in the achievement levels of participating students. Studies which looked at achievement over time found that thinking skills instruction accelerated the learning gains of participants, and those with true or quasi-experimental designs generally found that experimental students outperformed control group students to a significant degree. Reports with such findings include: Pearson 1982; Worsham and Austin 1983; Bass and Perkins 1984; Nickerson 1984; Sadowski 1984-85; Hansler 1985; Whitman and Whimbey 1985; Wong 1985; Bransford, et al. 1986; Horton and Ryba 1986; Hudgins and Edelman 1986; Sternberg and Bhana 1986; Tenenbaum 1986; Riding and Powell 1986, 1987; Marshall 1987; Robinson 1987; Crump, Schlichter, and Palk 1988; Haller, Child, and Walberg 1988; Kagan 1988; Pogrow 1988; Ristow 1988; Matthews 1989; Barba and Merchant 1990; Freseman 1990; Snapp and Glover 1990. Boulter, 2006, confirmed that lateral thinking aids teams in functioning harmoniously together by sideling strong egos. It was asserted by these researchers that productivity increased by controlled use of particular modes of thinking to particular moments.
Stump (1990) and Zimmerman (1990) found that putting into practice the findings from the thinking skills research can help schools to teach these skills and students to gain and use them. In the same context Cotton’s research (1991) reviewed fifty-six documents related to thinking skills research and found that providing students instruction in thinking skills is important. These skills are necessary for people to have in our rapidly changing, technologically oriented world, but students, in general, do not have well-developed thinking skills. Instruction in thinking skills promotes intellectual growth and fosters academic achievement gains. The review also concluded that providing instruction in a variety of specific creative and critical thinking skills, study techniques, and metacognitive skills. The review even supported that many commercially available thinking skills instructional programs had been shown to bring about improvements in students' performance on intelligence and achievement tests. One important outcome of the report was that training teachers to teach thinking skills is associated with student achievement gains.

Choo described a major pilot project which attempted to address some of the key issues related to teaching thinking skills. In this paper, a brief description of the thinking model was provided as well as the key steps involved in implementing and delivering a thinking curriculum. In this Pilot Thinking Program various issues like relevance of teaching thinking, what are the thinking skills, the focus of attention - the skills or the content and the most suitable instructional approach were discussed. The report observed that whereas many educationists assumed that existing curriculum already teaches appropriate thinking skills, other approach considered certain thinking skills strategies taught in a separate thinking skills course as an elective as a better approach. A third approach was the infusion approach which seeks to integrate thinking into content instruction, and which is based on three key principles suggested by Swartz & Parks, 1994. The report asserted that more explicit the teaching of thinking is, the greater the impact it will have on students, more the classroom instruction incorporates an atmosphere of thoughtfulness, the more open students will be to valuing good thinking and more the teaching of thinking is integrated into content instruction, the more students will think about what they are learning. As the weight of research
suggests that a more explicit approach yields better learning, this approach was adopted in the pilot project. Swartz' instructional methodology for infusing thinking into content was chosen because its key features, namely, graphic organizers and thinking maps, was considered to be a useful starting point for the teaching of thinking skills in the classroom.

Taggart et al, 2005 reviewed a lot of literature on thinking skills. The extensive review prepared by him, included many parts. The first phase of the research explored classroom-based approaches for developing thinking skills (i.e. research within an educational setting). The literature was divided into two broad categories based on McGuinness’s (1999) distinction between ‘infusion’ approaches (enhancing pedagogy in general within everyday teaching) and ‘discrete’ approaches (using specific resources and techniques). The evidence relating to classroom-based research suggests that since 2000, little systematic evaluation has taken place of approaches to developing thinking skills in young children. A cursory examination of the literature by Costello, 2000 reveals descriptive accounts of thinking skills programs which suggest that young children do benefit significantly from being involved in them and that they do have the ability to reason, enquire and evaluate.

Of the demonstrably effective programs reviewed by Taggart, about half were of the infused variety, and the other half were taught separately from the regular curriculum. In addition, while several documents in the thinking skills literature (e.g., Bransford, et al. 1986; Baum 1990; and Gough 1991) offered support for infusion of thinking skills activities into subjects in the regular curriculum, others (Pogrow 1988; Matthews 1989; Baum 1990 and Freseman 1990) provided support for separate thinking skills instruction. As the weight of research suggested that a more explicit approach yields better learning, this approach was adopted in the present research. Further, Riggs and Peterson (2000) suggested that engaging young children in thinking was potentially problematic because they are often extremely engaged by what is most concrete and salient to them. So the researcher selected the student-teachers as her sample.
Approaches such as inquiry development and the techniques used in the HOTS program involved guiding students through the process of figuring out what strategies to apply and where those strategies can lead them. Some researchers and developers (e.g., Hansler 1985; Pogrow 1988; Orr and Klein 1991) offered evidence that this approach enabled students to learn thinking skills, rather than merely learning about them. Proponents of various training methods claimed that many students, particularly those whose out-of-school lives offered little exposure to higher-order thinking, couldn’t be expected to develop the thinking skills inferentially and must be taught them directly. The efficacy of direct instruction in a variety of thinking skills was demonstrated in the work of Pearson (1982); Wong (1985); Herrnstein, et al. (1986); Freseman (1990) and among others. Pogrow (1987) further recommended an extensive amount of time to produce results, for true thinking skills development to occur. Bass, 1984 investigated the relative effects of CAI and conventional instruction in enhancing the critical thinking skills of seventh grade students. Of the four kinds of skills taught and tested, students performed better after CAI instruction in two and better after conventional instruction in the other two.

The same was recommended by de Bono, 1972 for lateral thinking skills training when he insisted that the specific instruction of the Lateral Thinking would be inside an isolated curriculum. He concluded that setting aside a definite period for teaching Lateral Thinking is much more useful than trying to gently introduce its principles in the course of teaching some other subject. He asserted that once knowledge of lateral thinking exists, the act of Lateral Thinking could cross domains and disciplines while performing problem solving activities. De Bono has even suggested that one hour/week during the educational process may be adequate to infuse Lateral Thinking. Once Lateral Thinking is introduced and cognitively implemented, the emphasis would be to use the theory throughout future work. Similar to de Bono, Maltzman’s Originality theory, 1960 supposed that a person’s originality could be amplified through practice in constructing unique results.
McKim (1986), through her research paper proposed three conditions to foster thinking that is productive and creative: Challenge, good conceptualization and creative actions of all kinds are enhanced considerably by fantasy; reflection and mental playfulness, rules is minimal and the mind is allowed.

Jacobs (2004) conducted his research on the ‘writers’ workshop’ approach to literacy in which children are given freedom over the subject for their writing. For the research the practitioners were asked certain questions. Interviews with 16 kindergarten children, based on these questions, were conducted (and then transcribed) twice a month over a six-month period. Jacobs argued that the increase in metacognitive language over this period pointed to a growth in the children’s awareness of their thinking. The research study concluded with the remark that ‘using the setting of the writers’ workshop seemed to provide a meaningful and natural environment in which to nurture metacognitive thought in children’ (Jacobs, 2004).

Craft (2003) used four vignettes from group work with three to six year-olds to show that problem-solving engages creativity and that this quality is not monopolized by the arts. These vignettes showed children engaged in conversation with the author, contemplating the options open to them in relation to a task they have been given. In this way, the children were said to be engaging in creativity, in so far as it is defined as ‘possibility thinking’.

RESEARCH SUPPORTS THE USE OF SEVERAL SPECIFIC THINKING SKILLS PROGRAMS. Cotton (1991) cited the following programs because they are widely known and used, are representative of the kinds of thinking skills programs in current use in schools, and have been studied by researchers. A lot of programs like CORT, HOTS, ICE, KIDS, SAGE, TU and THINK etc. were even found sufficiently effective. Baum, 1990 Identified ten thinking skills programs that were proven effective in increasing students' cognitive performance. Programs were organized by whether they involved infusing thinking skills into the established curriculum or provided a separate thinking skills course. All programs included teacher training.
Baum, 1990, found, Comprehensive School Mathematics Program (CSMP), an elementary-level math curriculum that focuses on classification, elementary logic, and number theory very effective. Through this program, he observed that children used computers, calculators and geometry models to pose problems, explore concepts, develop skills, and define new ideas. He also considered CORT (Cognitive Research Trust) effective. His research work found that this program was intended for use by students of any age/grade level, the program develops critical, creative, and constructive thinking skills over a three-year period.

Similarly, Pogrow, 1988, found HOTS (Higher-Order Thinking Skills) to be effective for teaching how to think. He mentioned that HOTS was a computer laboratory program for Chapter 1 and other elementary students that used readily available computer software in concert with specific teaching practices to enhance skills in metacognition, inferencing, and decontextualization, i.e., taking something learned in one setting and applying it to another. Crump et al 1988 Presented results of an evaluation of the effectiveness of training nearly all teachers and administrators in an Alabama school district in the Talents Unlimited model for teaching higher-order thinking skills. Teacher self-reports were positive, and the performance gains of middle and high school students on thinking skills assessments indicated that the program was successful. Even Baum, 1990 supported the same. In his research Baum, 1990, found Institute For Creative Education (ICE) to be as effective as the other programs. He observed that ICE was a creative problem-solving process for students in grades K-12 that developed students' ability to apply the creative thinking qualities of fluency, flexibility, originality, and elaboration to problem-solving activities.

Sternberg and Bhana, 1986, studied Instrumental Enrichment (IE) in which upper elementary and secondary students engaged in clusters of problem solving tasks and exercises that were designed to make students "active learners" and enhance their general learning ability. They found the program effective which was further supported by Baum, 1990. Baum,1990 also found Kids Interest Discovery Study (KIDS) KITS effective where elementary schools conducted surveys of students' interests and, based
on results, students were engaged in active, self-directed learning and higher-level thinking around selected topics.

Sternberg and Bhana, 1986, in their work cited programs like ODYSSEY, Philosophy for Children, Problem Solving and Comprehension to be very effective. They found that Odyssey was used by upper elementary or secondary students, focusing on six aspects of cognitive functioning—the foundations of reasoning, understanding language, verbal reasoning, problem solving, decision making, and investive thinking and considered it effective. Philosophy for children, according to them, was designed to develop thinking and reasoning skills through classroom discussion of philosophical topics, the program was organized around six novels in which children applied philosophical thinking to their daily lives. The curriculum spans the entire K-12 range. Baum, 1990, also found this program effective.

Sternberg and Bhana, 1986, studied problem solving and comprehension and found that this program concentrated on four problem-solving components—decoding skills, vocabulary, basic arithmetic operations, and precise thinking. They also found that SOI was based on Guilford's structure-of-intellect theory and was organized around the development of 120 intellectual skills from foundation level to higher order and emphasizes reasoning as the key component of successful learning. Baum, 1990, also found SOI effective.

Sternberg and Bhana, 1986 as well as Baum, 1990 found that Sage was designed for gifted elementary students and extended the regular curriculum through incorporating thinking skills development activities, mini-study units, and independent study.

A study by Crump et al, 1988, found Talents Unlimited (TU) to be effective. TU was designed for elementary students and helped participants develop multiple thinking skills (called "talents" in the program). Teachers received training to instruct their students in productive thinking, decision making, planning, forecasting, communication, and knowledge base development. Baum, 1990 also found TU effective.
Worsham and Austin, 1983, found THINK, a program in which secondary students engaged in problem-solving activities in which they were encouraged to discuss the rationales leading to their conclusions, consider other points of view, and analyze various reasoning processes, to be effective. Whereas Mc Leod and Cropley, 1989, considered that the development of thinking skills and abilities depend on extent the individual is exposed to an array of unconventional experiences. On the other hand Devereux (2002) stressed the importance of appropriate questioning in stimulating thinking.

Adey et al., 2002 studied Cognitive Acceleration though Science Education (CASE). This approach was based on the Piagetian notion that children progress intellectually through different stages as they experience cognitive conflict between events and their current understanding of the world. A more qualitative study was conducted by Venville et al., 2003 which found that children in CASE lessons more frequently explained and demonstrated their ideas and made suggestions. All the above programs were found to be effective in developing thinking skills. But as already mentioned that the findings emerging from the thinking skills research (Cotton, 1991) included that the students, in general, do not have well-developed thinking skills. It also emphasized that although many people once believed that we are born either with or without creative and critical thinking abilities, research has shown that these skills are teachable and learn-able. This led to a lot of research on the effectiveness of different thinking programs on the thinking skills.

Hickey et al (2000) presented a range of teaching strategies developed by teachers of literature who heard the call from students, employers, and academic administrators for more relevant learning experiences in an ever-changing world. Integrating critical theory and classroom experiences, the essays demonstrated how to foster learning, collaboration, cooperation, and creative thinking.

Similarly techniques and resources to use to stimulate creativity through a web site for several "generations" of gifted and talented learners were discussed by Montgomery et al (1999). He discussed that to organize a web site to stimulate creativity, two categories
of development issues must be considered: intrinsic person variables, and process variables such as thinking skills, specific learning processes, and those person characteristics that are responsive to development.

**Integrating the cognitive research trust (CORT) program for creative thinking into a project-based technology curriculum** by Barak, Doppelt (1999) described the Creative Thinking in Technology (CTT) program in which creative thinking was presented as a synthesis between lateral thinking and vertical thinking, analyzed student projects in light of this definition of creativity, and explored the role technology can play in developing students’ higher order thinking skills.

The research work done in the field of thinking paved the way for the work on lateral thinking. It was noted that lateral thinking ability may directly affect the interaction patterns and indirectly determine the conceptual environments of group decision making. There are many models presented, involving convergent/divergent thinking, the four P’s: a process, a product, a person and a press (Rhodes and Brown, quoted by Feldhusen and Goh, 1995). At this time a lot of research was also started on hemispheric Specialization and Creative Thinking (Whitman, 1985; Mihov et al, 2010). Experiments show that most children rank highly creative (right brain) before entering school. Because our educational systems place a higher value on left brain skills such as mathematics, logic and language than it does on drawing or using our imagination, only ten percent of these same children will rank highly creative by age 7. By the time we are adults, high creativity remains in only 2 percent of the population. Even now most of the researches were concentrating on critical and creative thinking (Beyer, 1983; Oxman and Barell, 1983; Martin, 1984; Norris, 1985; Pressesian, 1986; Resnick, 1987; Pauker, 1987; Haqq, 1988; Walsh and Paul, 1988; Lipman, 1988; Ashton, 1988).

experimentatal treatment techniques for enhancing creativity and divergent thinking in secondary School Students. Researchers like Malhotra and Sucheta (1990) hypothesized that if metaphorical abilities are developed among children, creative thinking can be enhanced. In another study, Venkataraman, (1993) investigated the effect of synectics training on creativity and hemisphericcity of higher secondary students of Tamilnadu. Researcher like Jaria, (1981), Bhaskar (1982) and Gakhar (1991) tested the utility of a particular type of instruction material with a group of Secondary School Students for forty to sixty days and found it to be effective. But Mandal (1992) evolved an autonomous creativity cultivation programme for school students and found it not to be effective for creativity development. One such work by Bala (2000), studied the effect of instructional package upon lateral thinking and vertical thinking of the students. Findings of the study were positive in terms of effect of the instructional package on both lateral and vertical thinking of primary school children.

A new method of thinking was introduced by de Bono and was named lateral thinking by him. One study which sought to apply the work of de Bono to five kindergarten classes in Malta (Dimech and Pace, 2003) is based on the idea of ‘lateral thinking’, that divergent and creative approaches to problem-solving can be more successful than linear reasoning. The children took part in age-appropriate exercises in creative problem-solving and the kindergarten staff considered that the intervention increased pupils’ self-expression and confidence. However, the lack of any rigorous methodology makes it difficult to draw any firm conclusions about the usefulness of this approach with young children.

This skill of ignoring one’s ‘real-world’ knowledge and working from the premises given can be seen as essential to the process of reasoning. Harris and Leevers (2000) noted that children have an ‘empirical bias’ when the problem is rooted in their experience but that, when based on fantasy (i.e. ‘every banana is purple’), they can reason logically with what they are given.

Rothenberg (1976) through intensive clinical and experimental research with creative and non-creative subjects began identifying properties common to creative experience.
He had clearly demonstrated the existence of two thought processes which affect creativity, ‘Janusian thinking’ and ‘Homospatial thinking’. Janusian thinking allows the juxtaposition of two contradictory concepts or images to form a single, unique and unified idea. Named after the Roman god Janus, Janusian Thinking involved holding two opposing ideas or images in one’s mind at the same time. Rothenberg discovered this way of thinking in the early 1970s after concluding that most major scientific breakthroughs and artistic masterpieces occur through the process of formulating antithetical ideas and then trying to resolve them. Homospatial thinking was the visualization in the ‘mind’s eye’ of two separate entities simultaneously occupying the same space producing a new mental image. The latter was frequently associated with verbal and musical metaphor and with visual obstruction. These views were further introduced by De Bono in form of structured methods and strategies which he named provocations.

Critical thinking and creativity, an overview and comparison of the theories by Marrapodi (2003) studied the commonalities between critical thinking and creative thinking? The researcher found it interesting that one of the techniques of creative thinking was to juxtapose unrelated topics to see what evolves from matching them. He found matching the two was for K-12 teachers, because the teaching of these two concepts and practices was being strongly advocated in many public schools. The same strategy, random juxtaposition is one of the strategy of PO method in the present study.

De bono, 1972 created the concept of PO, or provocation operation, which is designed to break out of existing patterns. One other method de Bono used was to introduce a random word into the discussion. Mixing in an unrelated concept causes the brain to think in a different direction and come up with new links, combining previously unrelated ideas to form new ones. This method attracted the attention of researcher. Although an instructional package on lateral and vertical thinking was found effective (Bala, 2000), no conclusive work was available on PO method. The present study is a pursuit in the same direction.
The researchers like Sansanwal and Joshi (1980), Mullick (1985), indicated that the programmed instruction was superior to the conventional method in terms of students’ achievement on the criterion test. Rao 1982; Patel, 1988; Gill, 1990; Bhagwat, 1992; Dubey, and Joshi, 1993; Sharma, 1995; Mehrotra, 1996; Kumar, 1996 and Jain, 1997; prepared different self-instructional or programmed learning material. But researchers like Mukhopadhyay (1982) supported modular approach over programmed learning material because of their ability to be used for all subjects, explanatory or scientific. The effectiveness of the module was tested and supported by Merwin and Schneider (1973), Mukhopadhyay (1982), Hopper (1984), Dhillon (2007), Pazhanival, (2004). As the findings of the studies reviewed above paved way for the construction of the module on PO method, no directional hypotheses could be conceived in absence of any research work on effectiveness of PO method. Therefore, a null hypothesis was framed.

Findings emerging from the thinking skills research reviewed in this study suggested that providing instructions in thinking skills is must in rapidly changing technologically oriented world. The thinking skills whether creative or critical, are teachable and learnable. The reviews also ensured that the instructions in thinking skills promotes the intellectual growth and fastens academic achievement gains. Many commercially available research programs have been shown to bring about improvements in students performance.

Further infused thinking skills instructions and separate curricula both were found to be equally effective in improving student performance. It was also found important to establish and maintain a positive, stimulating and encouraging classroom climate for thinking skills instruction, so that students feel free to experiment with new ideas and approaches.

The findings of the studies reviewed above are yet conflicting as well as inconclusive. Therefore, the directional hypothesis could not be conceived from the review. In this perspective it was decided to have a null hypothesis while studying the effect of PO method on lateral thinking of student teachers for all the dependent variables.