CHAPTER 1

INTRODUCTION
CHAPTER I

INTRODUCTION

1.1 Background of the Study

The goal of helping students to become effective thinkers is fundamental to any educational practice and is certainly not a new idea. John Dewey saw the development of an individual capable of reflective thinking as a prominent educational objective. The National Policy on Education - 1986 subsequently modified in 1992 has justifiably emphasised, "subject should be visualised as the vehicle to train the child to think, analyse, reason and articulate logically".

Scholars are of the opinion that thinking is not another educational option. Rather it is an indispensable part of it, because being able to think critically is a necessary condition for being educated, and educationists have come to realise that teaching for developing critical thinking is an essential function of School. But how far have we achieved this? After independence, some great minds of our country have examined from time to time the state of education both at school and college levels, and valuable documents like University Education Commission (1948-49), Education Commission (1964-68), Secondary Education Commission (1952-53) and National Policy on Education (1968 & 1986) have suggested the various steps to be taken for the qualitative improvement of education at different levels. Policies on education have been formulated almost in each decade but what actually had happened (and is happening) in our classrooms between the teachers and students, remains practically the same. Virtually all
informed persons agree that schooling today does not foster the higher order thinking skills and abilities which represents the basic of the future.

1.1.1 The Present Scenario and the Future Needs

India, a developing nation, has invested huge amounts for the cause of educational establishment. But after five decades of independence varying gaps remain. Research on education documents serious deficiencies in students reasoning. Students and educators alike are confused about the intellectual standards. It is clear that schools neither successfully teach students to think critically nor realise, that they are not doing so. As a result, we find our students after schooling are poor thinkers and inadequate problem solvers. The same even continues into their college education and finally the career. Many of them merely possess lower-order skills of rote memorisation. Too many passed their classes by cramming fragmented bits of information.

Years of rote memorisation and passivity are poor foundation at any educational level. Through over-emphasis on examination, with recent stress on objective type only, the educational system has made the students passive consumer of facts and not the active producer of ideas. In consequence, the classroom instead of becoming centre of inquiry, has degenerated in to lesson hearing room. The classrooms are more concerned with students rote use of procedures than with their understanding of concepts and development of higher order thinking skills.

Students apathy and resistance to active and reasoned involvement in the classroom is a product of years of didactic instruction. The teacher presents the materials to be learned, and the students are
expected to absorb it. There is very little teacher student or student-
student interaction. Except perhaps for an occasional question from a
student requesting clarification, or an occasional question from the
teacher testing comprehension. The teachers feel a greater obligation to
cover subject matter through lecture than to generate thought provoking
activities or assignments that may seriously reduce what they can cover
or significantly add to their work load or both. Most teachers take this
relatively traditional approach to instruction, relying heavily on
classroom presentation, text books, and work book. While such
techniques have helped many students attain basic levels of proficiency
in each subject area, they have not been as successful in helping
students achieve higher levels of performance. What is unfortunate
about this traditional approach is that it allows little real students
involvement beyond the actual recall level. Thinking is not only
encouraged but frequently not allowed.

The old way of educating that was passable in a relatively stable
world no longer works. Rote memorisation is useless when what is
memorised today is obsolete tomorrow. It is certainly easier in the short
run, to lecture students and test for their ability to restate the lecture. In
the long run, the didactic counterfeit of education leaves our citizens
grossly unprepared and unable to assume their responsibilities, now
unavoidable to make rational judgement about significant national and
global issues.

As we approach the end of the 20th century, drastic social,
political, economic, and environmental changes around the globe
demand citizens be trained to identify and analyse issues and problems
not merely memorise facts and follow directions. Social demands for
higher order thinking are increasing. There is an emphasis every where
in the need for a future work force capable of more sophisticated thinking than was generally required in the past. Such skills as independent analysis, flexible thinking and problem solving are now considered basic requirements for many jobs. In addition, in this information age which is characterised by the rapid expansion of knowledge and the emergence of increasingly sophisticated technologies, the ability to adopt quickly to change, along with the capacity and willingness to learn new skills on the job assumes greater importance.

The rapid increase of available knowledge has particular significance for education. Content teachers frequently lament their inability to cover all the materials in the content curriculum. The increased knowledge bases of many subjects quantitatively compound this task. It is clear that a different strategy is in order—one that emphasizes developing the lifelong learning and thinking skills necessary to acquire and process information within an ever-expanding field of knowledge.

It is time that we reverse the pervasive emphasis in education on lower rather than on higher order learning, on recall rather than on reasoning, on students merely "reproducing" rather than producing knowledge.

If the teachers and educators are to be successful in coping with the contemporary demands of the society, they cannot avoid focussing their major efforts in developing children who can think independently and critically.

1.1.2 Critical Thinking: A Historical Perspective

Philosophers, Psychologists and curriculum theorists have all
defined and analysed thinking skills. The perspectives of each discipline have resulted in somewhat different frameworks and terminologies, yet analysis of works that represent the major views of each field reveals substantial overlap.

Within the field of philosophy attempts to teach thinking and problem solving have been prevalent since the time of Aristotle and Plato. The concern of philosophers with the elements of critical thinking dates back to ancient times. If Dewy is the modern day founder of critical thinking movement then Plato and Aristotle are its ancient founders. Mann (1979) cited Plato's argument: "Arithmetic stirs up him who is by nature sleepy and dull, and makes him quick to learn, retentive, and shrewed. He makes progress quiet beyond his natural powers". Similar ideas were espoused by Sir Francis Bacon, who favoured the study of mathematics as a remedy to students lack of attention. In 1800's, many educators argued that the study of Latin would develop the mental discipline necessary to learn in any domain. Perhaps the oldest systematic account goes back to Aristotle. According to him the mind is composed of a number of separate powers or faculties, such as memory, judgement, reasoning and so on. These specific powers of the mind are thought to be capable of being developed and strengthened by suitable exercise much as the muscles of the body can be strengthened by a proper regimen of exercises. The whole educative process, then becomes a process of rigorous mental exercise. The ultimate outcome of a good education is a "trained mind".

If there is a modern day, founder of critical thinking movement, it is almost certainly John Dewy, who was simultaneously an educator, philosopher and psychologist. Dewy (1933) defined reflective thought as the "careful persistent examination of an action, proposal, or belief and
the analysis or use of knowledge in the light of grounds that justify it and its probable consequences. Smith (1953) also emphasized the judgemental aspect of critical thinking as "what a statement means and whether to accept or reject it". In his landmark paper, "A concept of Critical Thinking" Ennis (1962) elaborated on Smith's definition of critical thinking by delineating skills that called for the application of formal and informal logic. Ennis has since then considerably expanded his concept of critical thinking.

In more recent times philosophers such as Seigel (1980), Mcpeek (1984), Lipman (1988), Paul (1989) and Norris (1990) have devoted their attention to understanding the bases of critical thinking.

The emergence of psychology as a science, less than a century ago, was stimulated by developments in philosophy and by laboratory achievement in physiology and physics. Within the field of psychology, definition of higher-order thinking skills tend to place the reasoning skills proposed by philosophers within a broader framework.

Early in this century, uneasiness with the failure to address the thinking and reasoning potential of human beings was evident in the reaction to E.L. Thorndike's work. Thorndikes as a theorist, did not ignore higher level process but he reduced them to connectionistic conceptions. Despite, the dominance of connectionism, interest in establishing a cognitive basis for a pedagogy that fosters thinking and reasoning in school learning has been continuously expressed by educators and psychologists at least since John Dewy.

In 1945 Max Wertheimer in his book on productive thinking described an insightful series of studies on problems solving in
mathematics and science. He distinguished productive thinking from "blind intuition", equated the former with grasping the essential structure of the problem. In the late 1950s and early 1960s, behaviouristic psychology and its expression in programmed instruction strongly influenced instructional theory. Modern theories that are now contributing to the teaching of reasoning and understanding were beginning to emerge.

Psychologist interested in the nature of critical thinking such as Piaget, Guilford, Fuerestein, Sternberg, have been particularly concerned with characterizing critical thinking as it is performed under the limitations of the person and environment. Piaget's stages of development, particularly the distinction between formal and operational thought, are often used to differentiate among problems requiring logical reasoning. Guilford (1956) structure of the Intellects Model (SOI) has provided a ready source of hypothesised abilities that could be used as primary tools in critical thinking. Landis and Michael (1981) employed factor analysis to determine a minimum number of necessary constructs from SOI model for understanding critical thinking. It is reported that within the conceptual framework provided by SOI model, cognition of semantic classes, relations, and system; evaluation of semantic units classes, relations and transformation; and convergent production of semantic transformation held most promises as possible valid explanatory components or sub-constructs of critical thinking.

More recently Sternberg (1985) in his triarchic theory of intelligence viewed thinking skills as a subset of intelligent functioning. He proposed a framework based on his triarchic theory of intelligence, that can encompass the various theories of critical thinking. He proposed that theories of critical thinking can and often do deal with one or more
aspects of critical thinking - its relation to the mind of the individual, its relation to the context in which it occurs, and its relation to the experience of the individual with various kinds of task and situations previously confronted that required critical thinking in greater or lesser degree.

In the educational tradition of theorizing are leading figures such as Bloom (1956) Gagne (1980), Perkins (1981) and Renzulli (1976), whose theorizing seems directly responsive to the skills needed by children in the classroom for problem solving, decision making, and concept learning. Bloom's (1956) famous taxonomy of cognitive skills and Gagne's (1965) well known hierarchy of learning skills have seen widespread application in classroom situations. These theorists have drawn heavily on classroom observation, text analysis, and process analysis of thinking in the classroom to guide their thinking about critical thinking. In general, thinking skills clusters proposed in curriculum projects (for example, Bruner, 1966; Taba, 1963; Suchman, 1965; Covington, 1968) are the reasoning skills identified by philosophers and psychologists.

Looking across these three disciplines; we see that the goal of teaching thinking and problem solving is not unique to the 1980's and 90's. Attempts to achieve this goal have been espoused for centuries and have stimulated a variety of suggestions.

1.1.3 Concept of Critical Thinking

If we are to foster and strengthen critical thinking in schools and colleges, we need a clear conception of what it is and what it can be. We need to know its defining features, its characteristic outcomes, and the underlying conditions that made it possible.
Both philosophers and psychologists have addressed this question. The psychologist are interested in the process involved in critical thinking. They offers insight into how thinking occurs. According to Sternberg (1985) psychological theories tend to be performance theories specifying what people actually do. Philosophy on the other hand are more concerned with outcomes or products and also the philosophy offers insight into what ought to be included in critical thinking instruction. According to Sternberg (1985), philosophical theories of critical thinking are competence theory specifying what people can do. It tells us how people might think under ideal circumstances.

Although theorists provide a variety of explanation of critical thinking they do not necessarily reject each others explanations. They feel that their particular explanation most usefully conveys the basic concept highlighting what they take to be its most crucial aspects but do not necessarily hold that others explanations are wrong or lacking in usefulness. Novices on the other hand, typically get caught up in the wordingness of definitions and do not probe into them to see to what extent their meanings are in fact compatible. The various proposed explanations when examined, are in fact much more similar than they are different. In what follows here, a close examination of various of various explanations of critical thinking is made.

According to Ennis (1985) "critical thinking is reflective and reasonable thinking that is focussed on deciding what to believe or do". In so defining, he considers it as a goal directed thinking in which critical thinker consciously and rationally thinks about his or her thinking with a view to applying it in other contexts. For Ennis then critical thinking is a practical activity concerned with making decision of what to believe or do. This decision making results from the interaction of a set of
dispositions toward critical thinking with a set of abilities for critical thinking. Ennis's 13 dispositions of critical thinkers are listed in Table 1.1.1

However, having dispositions to think critically is not enough. A person may have a disposition to take position and change it when evidence and reasons are sufficient to do so. But how can he exercise this disposition unless he is competent to seek the sufficient evidence and reasons. To be successful in seeking evidence and reason, the person require certain abilities.

Ennis classify these abilities under five main categories, which are themselves further subdivided. The categories are elementary clarify related abilities, advanced clarify related abilities, inference related abilities, abilities related to establishing a sound basis for inference and abilities involved in going about decision making in an orderly and useful way. Each of these categories contain a large number of abilities. The details of these abilities are given in the Table 1.1.1
WORKING DEFINITION

Critical thinking as defined involves both dispositions and abilities:
1. Seek a clear statement of the thesis or question
2. Seek reasons
3. Try to be well-informed
4. Use credible sources and reason them
5. Compare, contrast, and evaluate
6. Try to remain relevant to the main point
7. Keep in mind the original and as free from preconception as possible
8. Look for alternatives
9. Be openminded
10. Look for alternatives
11. Seek reasons
12. Integrate, combine, conclude
13. Be sensitive to the setting, level of knowledge, and degree of sophistication of others
14. Use credible sources and reason them
15. Keep in mind the original and as free from preconception as possible
16. Deal in an orderly manner with the parts of the thesis or question
17. Take into account the total situation
18. Induce, induct
19. Define terms, and use them
20. Consider causes
21. Identify and formulate criteria
22. Consider consequences
23. Keep in mind the original and as free from preconception as possible
24. Identify and formulate criteria
25. Consider causes
26. Define terms, and use them
27. Analyzing arguments
28. See the structure of an argument
29. Induce, induct
30. Identify and formulate criteria
31. Consider consequences
32. Define terms, and use them
33. Analyzing arguments
34. See the structure of an argument
35. Induce, induct
36. Identify and formulate criteria
37. Consider consequences
38. Define terms, and use them
39. Analyzing arguments
40. See the structure of an argument
41. Induce, induct
42. Identify and formulate criteria
43. Consider consequences
44. Define terms, and use them
45. Analysis of evidence
46. Induce, induct
47. Identify and formulate criteria
48. Consider consequences
49. Define terms, and use them
50. Analysis of evidence
51. Induce, induct
52. Identify and formulate criteria
53. Consider consequences
54. Define terms, and use them
55. Identifying and judging arguments
56. Identifying and judging arguments
57. Identifying and judging arguments
58. Identifying and judging arguments
59. Identifying and judging arguments
60. Identifying and judging arguments
61. Identifying and judging arguments
62. Identifying and judging arguments
63. Identifying and judging arguments
64. Identifying and judging arguments
65. Identifying and judging arguments
66. Identifying and judging arguments
67. Identifying and judging arguments
68. Identifying and judging arguments
69. Identifying and judging arguments
70. Identifying and judging arguments
71. Identifying and judging arguments
72. Identifying and judging arguments
73. Identifying and judging arguments
74. Identifying and judging arguments
75. Identifying and judging arguments
76. Identifying and judging arguments
77. Identifying and judging arguments
78. Identifying and judging arguments
79. Identifying and judging arguments
80. Identifying and judging arguments
81. Identifying and judging arguments
82. Identifying and judging arguments
83. Identifying and judging arguments
84. Identifying and judging arguments
85. Identifying and judging arguments
86. Identifying and judging arguments
87. Identifying and judging arguments
88. Identifying and judging arguments
89. Identifying and judging arguments
90. Identifying and judging arguments
91. Identifying and judging arguments
92. Identifying and judging arguments
93. Identifying and judging arguments
94. Identifying and judging arguments
95. Identifying and judging arguments
96. Identifying and judging arguments
97. Identifying and judging arguments
98. Identifying and judging arguments
99. Identifying and judging arguments
100. Identifying and judging arguments
101. Identifying and judging arguments
102. Identifying and judging arguments
103. Identifying and judging arguments
104. Identifying and judging arguments
105. Identifying and judging arguments
106. Identifying and judging arguments
107. Identifying and judging arguments
108. Identifying and judging arguments
109. Identifying and judging arguments
110. Identifying and judging arguments
111. Identifying and judging arguments
112. Identifying and judging arguments
113. Identifying and judging arguments
114. Identifying and judging arguments
115. Identifying and judging arguments
116. Identifying and judging arguments
117. Identifying and judging arguments
118. Identifying and judging arguments
119. Identifying and judging arguments
120. Identifying and judging arguments
121. Identifying and judging arguments
122. Identifying and judging arguments
123. Identifying and judging arguments
124. Identifying and judging arguments
125. Identifying and judging arguments
126. Identifying and judging arguments
127. Identifying and judging arguments
128. Identifying and judging arguments
129. Identifying and judging arguments
130. Identifying and judging arguments
131. Identifying and judging arguments
132. Identifying and judging arguments
133. Identifying and judging arguments
134. Identifying and judging arguments
135. Identifying and judging arguments
136. Identifying and judging arguments
137. Identifying and judging arguments
138. Identifying and judging arguments
139. Identifying and judging arguments
140. Identifying and judging arguments
141. Identifying and judging arguments
142. Identifying and judging arguments
143. Identifying and judging arguments
144. Identifying and judging arguments
145. Identifying and judging arguments
146. Identifying and judging arguments
147. Identifying and judging arguments
148. Identifying and judging arguments
149. Identifying and judging arguments
150. Identifying and judging arguments
151. Identifying and judging arguments
152. Identifying and judging arguments
153. Identifying and judging arguments
154. Identifying and judging arguments
155. Identifying and judging arguments
156. Identifying and judging arguments
157. Identifying and judging arguments
158. Identifying and judging arguments
159. Identifying and judging arguments
160. Identifying and judging arguments
161. Identifying and judging arguments
162. Identifying and judging arguments
163. Identifying and judging arguments
164. Identifying and judging arguments
165. Identifying and judging arguments
166. Identifying and judging arguments
167. Identifying and judging arguments
168. Identifying and judging arguments
169. Identifying and judging arguments
170. Identifying and judging arguments
171. Identifying and judging arguments
172. Identifying and judging arguments
173. Identifying and judging arguments
174. Identifying and judging arguments
175. Identifying and judging arguments
176. Identifying and judging arguments
177. Identifying and judging arguments
178. Identifying and judging arguments
179. Identifying and judging arguments
180. Identifying and judging arguments
181. Identifying and judging arguments
182. Identifying and judging arguments
183. Identifying and judging arguments
184. Identifying and judging arguments
185. Identifying and judging arguments
186. Identifying and judging arguments
187. Identifying and judging arguments
188. Identifying and judging arguments
189. Identifying and judging arguments
190. Identifying and judging arguments
191. Identifying and judging arguments
192. Identifying and judging arguments
193. Identifying and judging arguments
194. Identifying and judging arguments
195. Identifying and judging arguments
196. Identifying and judging arguments
197. Identifying and judging arguments
198. Identifying and judging arguments
199. Identifying and judging arguments
200. Identifying and judging arguments

When the above mentioned abilities, interact with the critical thinking dispositions, there is a comprehensive picture of how to go about the process of deciding what to believe or do. This comprehensive overview is presented in the Figure 1.1.1.

Fig. 1.1.1: The Process of Deciding What to Believe or Do
The arrows coming from the disposition box in Fig. 1.1.1 depict the diffusion of the disposition's throughout the process of critical thinking. The sections of the list of abilities, Elementary clarification and advanced clarification, are concerned with the clarity that must permeate the process of critical thinking, as depicted by the arrows emanating from the clarity box in Fig. 1.1.1. The section of the list of abilities, Basic support, is concerned with the information basis for the decision. The inference section is concerned with the step from the basis to the decision, depicted by the inference box and the pointed inference columns, representing three basic types of inference. The strategy and tactics section connects the decision process with problem solving and emphasizes aspects of interacting with others, including making written and oral representations, and developing strategies for dealing with others. This section is represented by the boxes at the bottom of the figure (Ennis, Norris, 1990).

Paul Richard (1992) consider critical thinking in a strong sense. On this view he distinguishes two important sense of critical thinking, a weak sense and a strong one. Those who think critically only with respect to monological issues and as a result consider multilogical issues with a pronounced monological bias have merely mastered weak sense of critical thinking. This will serve the interest of a particular individual or group to the exclusion of other relevant persons and groups. On the other hand, the strong sense of critical thinking involves a concern for other persons arguments. It takes into account the interests of diverse person and groups. In this sense, a critical thinker is one who is able to think well and fairmindedly not just about her own beliefs and viewpoints, but about beliefs and viewpoints that are diametrically opposed to his or her own. This ability to see things from others point of view, which may be novel and contradictory with respect to one's point of
view is what Paul refers as dialogical thinking.

According to Paul, there are three groups of mental structures essential to the development of a critical thinker: (1) proficient micro-skills, such as the ability to recognise a vague sentence, a questionable assumption, a contradiction or inconsistency, an inference or implication; (2) refined macro abilities, such as the ability to read and write critically, engage in give-and-take of discussion and debate, evaluate sources of information, or create and explore arguments and theories; and (3) traits of mind, which are the intellectual virtues and moral commitments that transform thinking from a selfish, narrow-minded foundation to a broad, open minded foundation. Table 1.1.2 shows the dimensions of critical thought that these mental structures encompass.

No other theorists in the critical thinking movement address the underlying issues with the depth of philosophical analyses that Siegel offers. According to him a critical thinker is one who is "appropriately moved by reasons" (Siegel, 1989, p. 24). In so defining, he relate critical thinking with rationality he consider critical thinking as an emodiment of the ideal of rationality. In his view critical thinking is best conceived as the educational cognate of rationality. Rationality in turn is to be understood as being "co-existence with the relevance of reasons" (Scheffler, 1965, Quated in Siegel, 1989). A critical thinker is one who recognize the importance, and convincing force of reasons. When assessing claims, evaluating procedures, or making judgements, the critical thinker seeks reasons on which to base his or her assessment, evaluation or judgement. Moreover, to seek reason is to recognize and commit oneself to principles governing such activity. Critical thinking is thus, principled thinking (Siegel, 1980, p. 8).
### TABLE NO. 1.1.2

#### 35 Dimensions of Critical Thought

<table>
<thead>
<tr>
<th>A. Affective Strategies</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>S-1 thinking independently</td>
<td></td>
</tr>
<tr>
<td>S-2 developing insight into egocentricity or sociocentricity</td>
<td></td>
</tr>
<tr>
<td>S-3 exercising fairmindedness</td>
<td></td>
</tr>
<tr>
<td>S-4 exploring thoughts underlying feelings and feelings underlying thoughts</td>
<td></td>
</tr>
<tr>
<td>S-5 developing intellectual humility and suspending judgment</td>
<td></td>
</tr>
<tr>
<td>S-6 developing intellectual courage</td>
<td></td>
</tr>
<tr>
<td>S-7 developing intellectual good faith or integrity</td>
<td></td>
</tr>
<tr>
<td>S-8 developing intellectual perseverance</td>
<td></td>
</tr>
<tr>
<td>S-9 developing confidence in reason</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>B. Cognitive Strategies — Macro-Abilities</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>S-10 refining generalizations and avoiding oversimplifications</td>
<td></td>
</tr>
<tr>
<td>S-11 comparing analogous situations: transferring insights to new contexts</td>
<td></td>
</tr>
<tr>
<td>S-12 developing one's perspective: creating or exploring beliefs, arguments, or theories</td>
<td></td>
</tr>
<tr>
<td>S-13 clarifying issues, conclusions, or beliefs</td>
<td></td>
</tr>
<tr>
<td>S-14 clarifying and analyzing the meanings of words or phrases</td>
<td></td>
</tr>
<tr>
<td>S-15 developing criteria for evaluation: clarifying values and standards</td>
<td></td>
</tr>
<tr>
<td>S-16 evaluating the credibility of sources of information</td>
<td></td>
</tr>
<tr>
<td>S-17 questioning deeply: raising and pursuing root or significant questions</td>
<td></td>
</tr>
<tr>
<td>S-18 analyzing or evaluating arguments, interpretations, beliefs, or theories</td>
<td></td>
</tr>
<tr>
<td>S-19 generating or assessing solutions</td>
<td></td>
</tr>
<tr>
<td>S-20 analyzing or evaluating actions or policies</td>
<td></td>
</tr>
<tr>
<td>S-21 reading critically: clarifying or critiquing texts</td>
<td></td>
</tr>
<tr>
<td>S-22 listening critically: the art of silent dialogue</td>
<td></td>
</tr>
<tr>
<td>S-23 making interdisciplinary connections</td>
<td></td>
</tr>
<tr>
<td>S-24 practicing Socratic discussion: clarifying and questioning beliefs, theories, or perspectives</td>
<td></td>
</tr>
<tr>
<td>S-25 reasoning dialectically: comparing perspectives, interpretations, or theories</td>
<td></td>
</tr>
<tr>
<td>S-26 reasoning dialectically: evaluating perspectives, interpretations, or theories</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>C. Cognitive Strategies — Micro-Skills</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>S-27 comparing and contrasting ideals with actual practice</td>
<td></td>
</tr>
<tr>
<td>S-28 thinking precisely about thinking: using critical vocabulary</td>
<td></td>
</tr>
<tr>
<td>S-29 noting significant similarities and differences</td>
<td></td>
</tr>
<tr>
<td>S-30 examining or evaluating assumptions</td>
<td></td>
</tr>
<tr>
<td>S-31 distinguishing relevant from irrelevant facts</td>
<td></td>
</tr>
<tr>
<td>S-32 making plausible inferences, predictions, or interpretations</td>
<td></td>
</tr>
<tr>
<td>S-33 evaluating evidence and alleged facts</td>
<td></td>
</tr>
<tr>
<td>S-34 recognizing contradictions</td>
<td></td>
</tr>
<tr>
<td>S-35 exploring implications and consequences</td>
<td></td>
</tr>
</tbody>
</table>

reason assessment component of critical thinking, and is able to assess reason, and to understand the nature of reason and their assessment, it is not sufficient for him to be a critical thinker. Equally necessary is that a person have a willingness and an appropriate attitude towards critical thinking. This is were he brings in the second component of critical thinking, the critical attitude or critical spirit component.

In order to be critical thinker, a person must have, in addition to the reason assessment component, certain attitudes, dispositions, habits of mind, and character traits, which together may be labelled the critical attitude or critical spirit. By critical spirit he meant a person must be disposed to make use of his reason assessment component and he should have a willingness and commitment to confirm judgement and action to principle. Above all he should have certain character which is inclined to seek, and to base judgement and action upon reasons; which reject partiality and arbitrariness; which is committed to the objective evaluation of relevant evidence; and which values such aspects of critical thinking as intellectual honesty justice to evidence, sympathetic and impartial consideration of interests, objectivity, and impartiality.

According to Sternberg (1985) "Critical thinking comprises mental process, strategies, and representation people use to solve problems, make decisions, and learn new concepts". This account of critical thinking is based upon his Triarchic Theory of Human Intelligence, which views thinking skills as a subset of intelligent functioning. Based on this theory, he views critical thinking skills from three aspects of intellectual functioning as discussed in the following paragraphs.

The first aspect is relation of thinking skills to the internal world of
individual. It is aimed at the very essence of what critical thinking is about. What do we do when we think critically and how do we do it. In order to understand the critical thinking skills we must first identify the mental processes and representation underlying thought. Sternberg divides these mental processes or skills involved in critical thinking into three basic kinds: Metacomponents, Performance components and knowledge acquisition components.

Meta-components are higher order executive processes used to plan what one is going to do, monitor while one is doing it, and evaluate it after it is done. The performance components are lower order, non-executive processes used to execute the instructions of the metacomponents and provide feedback to them. And the knowledge acquisition components are the processes used to learn concepts or procedures.

The second aspect of intellectual functioning is that the relation of thinking skills to the external world of the individual. The relation of thinking skills to the external world of the individual deals with the contextual antecedents and consequences of the use of mental representations, processes, and strategies. Here is what he brings in the importance applying critical thinking skills into the practical affairs of every day world. Here, he emphasizes that critical thinking skills should be taught in a way that maximize the probability of their transfer to real life situation.

The third aspect is the relation of thinking skills to the experience of the individual. It deals with the interface between the internal world, on the one hand, and the external world on the other: It is through experience that this interface is achieved. In the triarchic theory,
emphasis is placed on two levels of experience: coping with novelty and automatization of information processing. Coping with novelty involves dealing with task and situations that are not only new, but new in kind. Automatization of information processing comes to play when material that is novel becomes quite familiar. The more the student is able to automatize information processing, the more the mental resources left over for coping with new kinds of challenges. The details are given in the Table 1.1.3.

**TABLE 1.1.3**

*Three Aspects of Intellectual Functioning*

<table>
<thead>
<tr>
<th>I.</th>
<th>Internal World of The Individual</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Metacomponents,</td>
</tr>
<tr>
<td>*</td>
<td>Recognizing that a problem exists.</td>
</tr>
<tr>
<td>*</td>
<td>defining the nature of the problem</td>
</tr>
<tr>
<td>*</td>
<td>Selecting a set of lower-order processing components or steps to solve the problem.</td>
</tr>
<tr>
<td>*</td>
<td>Combining the processes or steps into an overall strategy.</td>
</tr>
<tr>
<td>*</td>
<td>Selecting a mental representation (for example, spatial or linguistic) upon which the components and strategies can act.</td>
</tr>
<tr>
<td>*</td>
<td>Monitoring one's own problem solving.</td>
</tr>
<tr>
<td>*</td>
<td>Understanding and using external feedback.</td>
</tr>
</tbody>
</table>

| 2. | Performance Components |
| * | Inferring relations between stimuli |
| * | Applying previously inferred relations to new stimuli |
| * | Mapping higher-order relations between relations. |

| 3. | Knowledge-acquisition components |
| * | Selective encoding - determining what information is relevant and what is irrelevant for one's particular purposes. |
| * | Selective combination - putting the relevant information together. |
| * | Selective comparison - relating new information to old information. |
II. Functions in context
* Adaptation - one changes oneself or one's resources to fit the environment.
* Shaping - one changes environment to fit oneself or one's resources.
* Selection - One simply choose a new environment.

III. Factors of experience
* Coping with Novelty - dealing with tasks and situations that are not only new, but new in kind.
* Automatization - Automatization of information processing comes to play when material that was once novel becomes quite familiar

In Sternberg's approach, critical thinking becomes redefined as adaptive intelligence. What is valued in this form of critical thinking is not so much the mastery of the abstract syntactic principles but actual problem solving (Benderson quoted in Haynes, 1991). Like that of Ennis for Sternberg too critical thinking is a practical activity of problem solving.

According to Mathew Lipman, Critical Thinking is skillful, responsible thinking that facilitates good judgement because it (1) relies upon criteria (2) is self correcting, and (3) is sensitive to context" (Lipman, 1988). His account highlights six key elements in critical thinking. To begin with, critical thinking is a skillful thinking, and according to him these skills are proficient performances that satisfy relevant criteria. So to think critically one need to employ a vast variety of cognitive skills, which he considers grouped into families such as reasoning skills, concept formation skills, inquiry skills, and translation skills.

The second aspect in his definition is responsible thinking. It points to the relationship between critical thinker and the community
that he or she addresses. The critical thinker sees an obligation to present reason in light of acceptable standards, because such reasons are subject to the judgement of competent members of fields relevant to the issue involved. Then he emphasize upon good judgement. Here he brings our attention that a casual thinking will not lead to good judgement, because it is not based upon any relevant reason and criteria. Critical thinking is called for in those situation in which considerations must be weighed and alternatives assessed, situations that call for the assessment of priorities and determination of truth and relevance.

The criteria are the next aspect. Criteria are those reasons that reflect the critical thinker's assessment of the essential factors to be taken into account when offering an analysis or when supporting and challenging a claim. Lipman offers a number of examples that indicate what he has in mind by criteria; these include: "Standards, Laws, regulations, guidelines, directions, requirements, specifications, stipulations, conventions, norms, regularities, principles, assumptions, presuppositions, definitions, ideals, purposes, objectives, credentials, procedures, policies. A critical thinker, thus, is called upon to make the framework of her/his argument clear, and to make available, the considerations that she takes as crucial to the inquiry in which he/she is engaged. These criteria are not taken as absolute, rather they may be questioned, and changed or even replaced, as critical thinking progresses. In his view the next aspect of critical thinking is that it is self-correcting, a critical thinker is subjected change his or her view when there is sufficient reason to do so. A critical thinker welcomes the critique and re-evaluation of his or her reasoning. Lastly, critical thinking is sensitive to context. While thinking critically a person uses criteria in relation to the context of their application.
National Council for Excellence in Critical Thinking Instruction (1991) stated "Critical thinking is the intellectually disciplined process of actively and skillfully conceptualizing, applying, analyzing, synthesizing or evaluating information gathered from or generated by, observation, experience, reflection, reasoning or communication as a guide to belief and action".

Critical thinking has been defined variously by various distinguished scholars. However, a close examination of these definitions reveal that to a great extend all these definitions say something in different ways. The amount of agreement among scholars regarding the nature of critical thinking clearly outweigh the disagreement.

Recent literature in the field of critical thinking has included definitions and analysis of critical thinking ranging from the broad definition of Seigel (1988) to the detailed articulation of skills and dispositions found in the work of Ennis (1985).

Most of the main account of critical thinking including those of Ennis, Paul, Mcpeck, Seigel, Sternberg, agree at least to this extent; critical thinking has (at least) two central components: a cognitive component, which involves abilities and skills relevant to the proper understanding and assessment of reasons, claims, and arguments, and an affective component which is understood as a complex of dispositions, attitudes, habits of mind, and character traits. Considering the cognitive components, Ennis call it as critical thinking abilities and list down hundred and odd, Paul name it as macro abilities and micro skills and list down 26 of it. Seigel consider this as reason assessment component, and Sternberg view this from three aspects of intellectual functioning by listing down subcategories. Coming to affective
component, Ennis call it as critical dispositions and list down thirteen of it. Paul name it as affective dimension and identify nine of it. Harvey Seigel name it as critical spirit and Robert Sternberg consider this as motivational factors.

Thus, we observe that critical thinking is the art of self-monitored, self-correcting, and self-disciplined thought. Critical thinkers apply internal standards of thoughts to their thinking while they think. Clarity, accuracy, precision, consistency, relevance depth and breadth are standards that apply to all disciplined thought. A critical thinker is one who appropriately move by reasons. He has a willingness and an ability to scrutinize and evaluate thinking - one's own as well as others' - to determine truth, accuracy, or worth and to construct logical arguments to justify claims or assertions. Such a thinking is called critical because it judges according to prescribed criteria, not because it is negative or accusatory. The abilities to recognize, analyse, judge and formulate valid argument through the application of reasoning and rules of logic are central to critical thinking.

1.1.4 Programs for Developing Critical Thinking

The programs for developing critical thinking skills have been with us for thousands of years, although they have not always been recognised as such. The traditional name for such programs has been logic. In recent years a good deal of interest has been expressed concerning the possibility of teaching thinking skills, and a number of techniques purporting to teach such skills have been developed (Bransford and Stein, 1984; Covington, Crutchfield, Davies and Olton, 1974; De Bono, 1975; Lipman, Sharp and Oscanyan, 1980; Whimbey and Lochhead, 1980; Paul 1989; Sternberg, 1985; Feuerstein, Rand Hoffman and Miller, 1980). What follows here is a brief description about
various programs meant for developing critical thinking.

Whimbey and Lochhead (1980) designed a program entitled "Problem Solving and Comprehension: A Short Course in Analytical Reasoning". This program is fairly typical of educationally based programs for training critical thinking skills. It can be used as a main text or as a supplementary text on courses on critical thinking. The program requires thinking aloud to a partner about the steps taken in solving problems, problems like those used on intelligence, aptitude, and simple achievement tests. The partner points out but does not correct errors. The program assumes that few errors are not made because of lack of knowledge of vocabulary, arithmetical facts, and so on, but rather because of errors in reasoning such as: failing to observe and use all relevant facts of a problem; failing to approach the problem in a systematic, step by step manner; jumping to conclusions and not checking them; and failing to construct a representation of the problem. Through carefully designed problem exercises, the program elicits procedures for reasoning and problem solving that avoid these errors.

A second example is the longer term program developed by Feuerstein, Rand, Hoffman, and Miller (1980) entitled "Instrumental Enrichment: An Intervention Program for Cognitive Modifiability". This is designed to provide students with critical cognitive functions and strategies and to help them realize their potential to learn on their own. The technique has two ingredients. As a set of 14 (increasingly complex) paper and pencil exercises designed to help students identify basic principles of thinking and to practice self-monitoring with respect to use of these principles, and (b) a set of training procedures involving teacher-guided "bringing" back and forth between the principles identified in the exercises and various subject matters of interest. Feuerstein's theory is
basically a theory of cognitive development, and the key construct of this theory is what Feuerstein calls a "Mediated Learning Experience" (MLE). MLE is said to occur when an individual is shown or taught cognitive methods for interpreting information, for solving problem, or for learning something. This program, like Whimbey and Lochheads, is seen as a bridge between relatively content-free exercises and thinking in curriculum content domains.

The next two programs to be described here differ from those just mentioned in that they teach thinking in the context of generally familiar knowledge. Covington, Crutchfield, Davies, and Olten (1974) have published a program entitled, "The Productive Thinking Program: A Course in Learning to Think". Each lesson in the program is based on illustrated story which presents a challenging problem that students attempt to solve. The students are led through a problem-solving process and at appropriate points are required to state the problem in their own words, formulate questions, analyze information, generate new ideas, test hypotheses, and evaluate possible courses of action. These procedures are formulated as thinking guides that are presented throughout the various lessons and problem sets.

Another program developed is the CoRT thinking program by de Bono (1975) in England (CoRT stands for Cognitive Research Trust). The specific thinking strategies taught are like the meta-cognitive, Self-monitoring strategies that have been already mentioned. A number of features of the program make it both similar and dissimilar to the others described here. The contents of the program are topics of interest in every day life, such as deciding on a career, how to spend one holiday, moving to a new house, and changing to a new job. This program emphasizes skills that are not dependent on the prior acquisition of curriculum
subject matter. However, unlike Whimbey and Lochhead and Feurestein, the CoRT program keeps away from puzzles, games, and other such abstractions.

"Philosophy for Children a Program for Developing Thinking Developed by Lipman, Sharp, and Oscanyan (1979, 1980), aims at fostering thinking skills in the specific context of school curriculum. Lipman and colleagues attempt to help children learn to think philosophically. They reject the assumption that "the learning process is nothing more than the transmission of the contents of human knowledge from the old to the young". They adopt an alternative position that emphasizes the importance of thinking. They emphasize that philosophical thinking does not simply involve thinking and reasoning; it involves thinking about thinking. According to them, a discipline that stress formal inquiry might be considered in the very, beginning of a curriculum rather than later in the educational process. Towards this end the several parts of this program employ the procedures of philosophic logic and inquiry in the context of science, ethics, social studies, and language arts. The program designers believe that thinking is de-emphasized in education that gives either knowledge acquisition or problem solving techniques a primary status. Lipman states that the pragmatic nature of inquiry must be made apparent in the course of acquiring knowledge and skill.

Sternberg's (1986) approach to teaching thinking is based on his Triarchic Theory of Intelligence. The program "Intelligence Applied: Understanding and Increasing Intellectual Skills" is designed to help people improve their abilities to perform the processes assumed to underly intelligent behaviour. It is appropriate for students in secondary school and college and can be used as either a semester or a year long
Sternberg's program is based upon several key instructional principles. First, one must teach for transfer, rather than by merely hoping it will occur. Second, the program, emphasizes motivating both students and teachers. Third, the program emphasizes training of metacomponents as well as performance components and knowledge acquisition components, as well as their application to novel and real world situations. Finally, the program has an entire chapter on emotional and motivational blocks to the use of one's intelligence. The program consists of two elements: a student's text, which contains narrative materials and exercises for students to complete, and a teacher's guide, which contains material teachers can use to maximize the effectiveness of the program.

Richard Paul et al. (1989) of The Center for Critical Thinking and Moral Critique at Sonoma State University in Rohnert Part, California, have developed four handbooks for critical thinking which illustrating the remodelling of lesson plans for critical thinking instruction. The handbook explain critical thinking by translating general theory into specific teaching strategies. The multiple strategies allow "novice" critical thinkers to begin with elementary strategies, while more "advanced" critical thinkers can use more complex strategies. The four grade level handbooks can be used either as the basis for critical thinking staff development, or an independent resource for teachers. Starting from standard lessons and standard practice, the teacher sees what the weaknesses in standard lessons and how they may be remedied. The use of multiple strategies in the handbook addresses the need to integrate the cognitive and affective domains of thought, thus going beyond on skills alone.
The program is based on the assumption that if teachers can develop the art of critiquing lesson plans they use and learn how to use that critique as the basis for remodelling the lesson plans, they will progressively (a) refine and develop their own critical thinking skills and insights (b) reshape the actual or living curriculum, and (c) develop their teaching skills.

1.1.5 Assessment of Critical Thinking

Determining the quality of people's critical thinking requires gathering information on their thinking. Testing is one way of gathering this information, but there are others, such as non-manipulative observation of various sorts, interviews, and questionnaires. Several test have been advanced that purport to measure critical thinking skills. These tests overlap to a large degree in the skills they measure. The most common critical thinking tests are in a multiple-choice format, which makes them easy to score by machine. One obvious advantage of machine-scorable tests is the economy achieved by their large scale use in testing. Some of the commonly used critical thinking tests are discussed below.

**The Curry Test of Critical Thinking.** The Curry Test of Critical Thinking (Curry, 1971), is a pencil and paper objective test designed to measure critical thinking ability. Norms were established on students from the Ninth through Twelth grades. The five subtests are (a) Fact and Opinion, (b) False Authority, (c) Making an Assumption, (d) Inadequate data and (e) Improper Analogy. For total scores the estimated split-half reliability coefficient corrected by the Spearman-Brown formula was .72. That the 10 intercorrelations among the five subtests were not greater than .20 suggested that each subtest was relatively unreliable or that the subtests were measuring different critical thinking abilities. Curry (1971)
reported that her test did not discriminate against poorer readers and that vocabulary it used was geared to the range of normal reading abilities found in the Ninth through Twelfth grades.

The Cornell Critical Thinking Test (Ennis and Millman, 1985) is based on Ennis's conception of critical thinking, as briefly described earlier. The test is available in two levels, X and Z. Level X is appropriate for secondary School (Grade 7) and beyond. Level Z primarily for college students (and bright secondary school students). Level X has 71 questions and a time limit of 50 minutes. Level Z has 52 questions but the same time limit as Level X.

Level X contains four sections. The first section contains items asking for the bearing, if any, of information on a hypothesis. The hypothesis is in every case a general statement. Examinees must indicate whether a particular hypothesis is warranted by the data. The second section is concerned with measuring examinees ability to judge the reliability of information on the basis of its source and the conditions under which it is obtained. The third section measures students ability to judge whether a statement follows from its premises, and the fourth section involves identification of assumptions.

Level Z contains seven sections, measuring the examinee's ability to (a) indicate whether a statement follows from its premises, (b) detect equivocal arguments, (c) evaluate reliability of observations and authentically of sources, (d) judge the direction of support, if any, for a given hypothesis, (e) focus on choosing of useful predictions for hypothesis testing, (f) define terms, and (g) spot gaps in arguments.

Norms for both levels of the Cornell Critical Thinking Test are given
as percentile equivalents. Internal consistency reliabilities for various groups appear to center around 8 for Level X and around 7 for Level Z. Correlations with other tests are available. They seem to center around 5 for verbally oriented intelligence tests. The reported correlation with the Watson-Glaser, 48, is not higher than the correlation of the test with verbal IQ and scholastic aptitude measures. The correlation of the Cornell with the ACE Test of Critical Thinking, 44, is also no better than the correlation of the Cornell with the Watson-Glaser. These data are not auspicious in indicating a clear, differentiable construct of "critical thinking" apart from general verbal intelligence.

The Ennis-Weir Critical Thinking Essay Test. It was developed by Robert H. Ennis and Eric Weir (1985) is aimed at grades 7 through college. Also intended to be used as teaching material. Incorporates getting the point, seeing the reasons and assumptions, stating one's point, offering good reasons, seeing other possibilities, and responding to/avoid equivocation, irrelevance, circularity, reversal of an if-then relationship, overgeneralization, credibility problems, and the use of emotive language to persuade (Ennis, R.H. & Norris, S.P; 1990).

The Cornell Class - Reasoning Test, Form X (1964) by Robert H. Ennis, William L. Gardiner, Richard Morrow, Dieter Paulus, an Lucille Ringel at University of Illinois is aimed at grades 4-14). Consists of seventy-two items, each containing a premise asserting a class relationship, such as "No A's are B's". Each of twelve logical forms is tested by six items of varying types of content (Ennis, R.H. & Norris, S.P; 1990).

New Jersey Test of Reasoning Skills, Form B, developed by Virginia Shipman (1983) of the Educational Testing Service and promoted in conjunction with Lipman's Philosophy for Children program. The New
Jersey Test of Reasoning Skills is a 50-item inventory purporting to measure 22 different skill areas: converting statements, translating into logical form, inclusion/exclusion, recognizing improper questions, avoiding jumping to conclusions, analogical reasoning, detecting underlying assumptions, eliminating alternatives, inductive reasoning, reasoning with relationships, detecting ambiguities, discerning causal relationships, categorical syllogistic reasoning, distinguishing differences of kind and degree, recognizing transitive relationships, recognizing dubious authority, reasoning with four-possibilities matrices, contradicting statements, whole-part and part-whole reasoning, and conditional syllogistic reasoning. Like the other tests, this one is highly verbal. Its reliabilities are reported to be in the mid to high 80s, and it is reported to correlate at the .6 to .8 level with subtests of the New Jersey College Basic Skills Placement Test, which is a test of verbal and mathematical skills emphasizing achievement at least as much as aptitude. The fact that the New Jersey Test of Reasoning Skills correlates at the .8 level with the "Reading Comprehension" and "Sentence Sense" subtests of the placement test might be seen by some as slightly disturbing: all three of the tests described so far are highly verbally loaded, and one might well wonder, as to the extent that what they measure is separable from general verbal skills. Indeed, the little evidence accumulated so far does not indicate a clear separation at all, perhaps because a fairly high level of verbal comprehension is prerequisite for high scores on all of these tests.

The Triarchic Test of Intellectual Skills. This test is new, is currently available in two forms only from the author (Sternberg), and is not yet normed. The triarchic test is based on Sternberg's (1985) triarchic theory of intelligence and, hence, does not purport to separate critical thinking from intelligence. The test is appropriate for high school and
college levels. The 12 untimed subtests of the triarchic test are equally divided between verbal and nonverbal content and measure (a) metacomponential thinking skills (planning, monitoring, evaluating), (b) performance-componential skills (inferring relations, applying relations, mapping higher order relations between domains, (c) knowledge-acquisition componential skills (learning concepts in natural contexts), (d) ability to deal with novelty (distinguishing relevant from irrelevant information, combining relevant information in a logical way, bringing previously acquired knowledge to bear on the acquisition and understanding of new knowledge), (e) automatization of information processing (making conscious and controlled processing subconscious and automatized), and (f) adaptive flexibility (bringing the various kinds of skills described above to bear on everyday adaptation, as in route planning and evaluating inferential fallacies in everyday reasoning). No normative, reliability, or validity information are yet available (Sternberg, 1985).


In addition to these published and readily available tests a few people have worked and published in the area of critical thinking testing. In particular Wordan, (1981) developed a critical thinking/critical reading appraisal for grades three through six. Barfield (1997) developed an instrument for assessing critical thinking skills of language-minority elementary school students. To assess critical thinking a qualitative instrument was developed by Clauson (1997) which incorporate an assessment processes based on Dewy's (1933) concepts of self-reflection.
and critical thinking as problem solving. Claytor (1997) developed The Adult Medical Nursing Critical Thinking Instrument (AMNCTI) specifically to assess critical thinking skills in nurses. Mc Murray (1991) established the reliability and concurrent validity of a measure of critical thinking skills in biology. The 52 items in this test was selected from a readily available item pool developed for instructional purpose.

John Follman, of the University of South Florida, and associates published results of factor analyses of critical thinking tests with tests of achievement, scholastic aptitude, and logical reasoning (Follman, Hernandez, & Miller, 1969; Follman, Brown & Burg, 1970). They concluded that critical thinking is not a general ability but rather composite of general and specific factors, and that English Achievement correlated quite highly with critical thinking. W.B. Michael, of the University of Southern California, and associates have also been involved in factor analyses of critical thinking tests (Michael, Devaney, & Michael, 1980; Landis & Michael, 1981). In one of the studies Michael et al. held that Guilford's structure of intellect model holds promise as an explanation of critical thinking components. Modjeski and Michael (1983) evaluated the manuals of the Cornell and Watson-Glaser test against the standards for educational and psychological tests. Watson-Glaser test was evaluated as a superior measuring device to the Cornell with respect to number of essential standards.

The two most widely used tests, the Watson-Glaser and the Cornell tests, are listed under recent publication dates, but the original versions are much older. The Watson-Glaser was developed in the late 1930s, and the Cornell in the late 1950s. These tests have been steadily, though modestly, used since development, with Watson-Glaser probably the most often used of the two.
To conclude, several tests are available for measuring critical thinking skills. The philosophically based ones are highly loaded verbally but measure reasoning in the verbal context rather than straight knowledge or fact comprehension. The distinguishability of their scores from verbal intelligence is marginal. The psychologically based test contains both verbal and nonverbal test items. This test makes no attempt to distinguish between critical thinking and intellectual skills. All of the tests provide means for assessing reasoning without heavy demands upon students' knowledge base (Sternberg, 1985).

1.2 Need/Significance of the Study

The recent developments in critical thinking theory and practice show that it is an area of educational concern that can no longer be ignored. Significant amount of work both theoretical and practical has been done on critical thinking abroad. Now there is a growing awareness among the educators that critical thinking is a desirable human trait which should be taught explicitly in our schools. Concerned scholars and educators particularly abroad have enhanced our conceptual understanding of critical thinking, proposed instructional practices to promote it, designed curriculum and instructional materials that emphasises it, and developed assessment techniques to measure it. Much works remains to be done by practitioners.

We know that the success of any innovations depends upon the context in which it is implemented. Introduction and transfer of successful innovation from one country to another, one society to another, and one institution to another depends upon multiplicity and variety of contextual factors. If we have to implement critical thinking instruction in our schools, we must have a thorough understanding of
the existing context. We must know where our schools stand so far as critical thinking is concerned, what psycho-contextual factors promote it, and what socio-demographic variables influence the development of critical thinking of the students. Having identified the kinds of skills students need to develop now in order to function well in the future, it is imperative that we evaluate the capabilities that our students currently possess. Similarly if teachers are to be charged with developing students' critical thinking skills, the first step is to look at the methods teachers currently use and to find out what they actually accomplish. And it is research which helps us in this direction.

If one knows, the current level of critical thinking that students possess, the methods that teachers currently use to develop it, the psycho-contextual factors which promote it, and the socio-demographic variables which influence the development of it, in Indian situation, the process of developing critical thinking abilities in our students would be greatly improved.

In abroad a good deal of research had gone into the area of critical thinking. Intelligence as a correlate of critical thinking is studied by many researchers (Samuel, 1970; Handfield, 1980; Brabeck, 1981; Kehler, 1982; Rogers, 1992; Gambino, 1995). These studies concluded that the ability to think critically is significantly related to Intelligence. These studies were conducted on different samples and only one study (Kehler, 1982) was conducted on secondary schools. Hence, more studies need to be conducted on secondary school students particularly in India.

The relationship between critical thoughts and academic achievement was studied by several researchers (Samuel, 1970; Knite, 1980; Kwak, 1981; Kehler, 1982; Mayes, 1986; Alouf, 1989; Ircink,

Development of critical thinking is also studied in relation to various other variables such as age, gender, subjects taught, training, year of experience, and socio-economic status. No significant relationship between critical thinking and socio-economic status was reported by Handfield (1980), Johnson (1990), M Murithi (1998). Handfield (1980), Knight (1981), Kehler (1982), Sidney (1989), Ircink (1990), Smith (1990), Cargnel (1998) found no gender difference in critical thinking ability whereas Goldberg (1991), Brown (1991), Foss (1995) M' Murithi (1998), found significant gender difference in critical thinking ability. Hence, more studies need to be conducted in Indian context to find out whether there is significant sex difference in critical thinking.

Use of innovative teaching strategies in Science and Mathematics classrooms resulted in significant improvement in critical thinking (Samuel, 1970; Mc Cune, 1990; Sidney, 1989; Smith, 1996). Similarly Fennly (1989), Jordan (1991), Commeyras (1992), Dickson (1992) and Hendrix (1995) found that programs aimed at developing critical thinking brought out corresponding improvement in language abilities. Teachers use of critical thinking strategies in relation to the years of experience was studied by Boikai (1990) and Kezar (1992) and their findings are somewhat contradictory. Therefore, more studies need to be conducted in Indian context to see if the teachers vary in the use of critical thinking.
strategies in relation to the subjects they teach and the years of experience.

To the best of the knowledge of the researcher, only a limited number of studies (Pillai and Nayar, 1968; Nayar, 1969; Anju, 1989; Benny, 1990; Srikantaswamy, 1995; Coca, 1998; Sheeba, 1998) have so far been conducted in India. Thus Critical Thinking is one of the most neglected areas of research in our country. This necessitate more studies to be conducted by the researchers in India.

A significant positive correlation between critical thinking and achievement was found by Pillai & Nayar (1968), Nayar (1969), Benny (1990), Coca (1998), Sheeba (1998). Three of these studies were limited only to achievement in science and the remaining two studies (Coca, 1998; Sheeba, 1998) were conducted on B.Ed trainees and higher secondary students respectively. There are no studies conducted on secondary school students to find out the correlation between critical thinking and achievement in different school subjects as well as achievement as a whole. Nayar (1969) found a gender difference in critical thinking in favour of boys but no such difference was reported by other studies (Benny, 1990; Coca, 1998; Sheeba, 1998). Hence more studies need to be conducted to confirm the findings of sex difference in critical thinking. Coca, (1998) and Sheeba (1998) found no significant difference in critical thinking between rural and urban students. Similarly Nayar (1969) and Coca (1998), found no difference in critical thinking between the Government and private school students. Only two studies in each category may not be considered sufficient to arrive at valid conclusions regarding school difference (Management and location) in development of critical thinking.
Except one Ph.D study, all other Indian studies reported above are M.Ed or M.Phil dissertation, where the conclusions are not based on large scale representative sample. Moreover, there are no studies conducted so far to find out the possible influence of socio-economic status, home background and teachers experience on critical thinking. Hence there is a necessity to study critical thinking in relation to these variables.

In India, though many researchers have identified several teaching skills and their contributions, for effective learning specific to each subject, studies are yet to be conducted to identify the specific teaching behaviour/teaching skills which contribute for the development of critical thinking in students. Therefore, studies need to be conducted to find out whether secondary school teachers use suitable teaching strategies for developing critical thinking in the students while teaching different subjects, and the use of critical thinking teaching strategies has any effect on the students level of critical thinking.

Considering the facts stated in the proceeding paragraphs it is necessary to study the development of critical thinking among the secondary school students in Indian context. Whether the school as a context (types of school) affects the development of critical thinking, whether there exists gender difference in critical thinking, whether academic background of a student in any way influences his/her critical thinking are some of the questions which need to be answered by the researchers. Also it is desirable to study whether home background of a child influences his/her critical thinking ability. Moreover, it is necessary to investigate whether the teachers of our secondary schools employ the teaching strategies in teaching different subjects, which positively contribute towards the development of critical thinking in students. The
answers to these and other related questions will go a long way not only in expanding knowledge in the field but also in helping teachers practitioners to take suitable measures for developing critical thinking in students.

1.3 Specification of the Problem

1.3.1. Objectives of the study

The present investigation was conducted:

1. to establish norms for critical thinking ability of the secondary school students in the state of Goa.

and to study the:

2. levels of critical thinking of the secondary school students.

3. correlation between critical thinking and intelligence eliminating the effect of socio-economic status;

4. correlation between critical thinking and socio-economic status eliminating the effect of Intelligence;

5. correlation between critical thinking and academic achievement in different school subjects eliminating the effect of intelligence;

6. variation, if any, in critical thinking between the students studying in rural and urban schools eliminating the effect of intelligence;

7. variation, if any, in critical thinking between the students studying
in government and private schools eliminating the effect of intelligence;

8. variation, if any, between boys and girls in critical thinking eliminating the effect of intelligence;

9. variation, if any, in critical thinking between the students coming from Nuclear and Joint family eliminating the effect of intelligence;

10. Variation, if any, in critical thinking between Marathi speaking students and Konkani speaking students eliminating the effect of intelligence;

11. Variation, if any, in critical thinking among Hindu, Muslim and Christian students eliminating the effect of Intelligence;

12. extent to which the secondary school teachers make use of the various techniques/strategies for developing critical thinking in their students;

13. variation, if any, in the use of critical thinking teaching strategies between Government and Private school teachers;

14. variation, if any, in the use of critical thinking teaching strategies among Science, Social Studies and Language teachers;

15. variation, if any, in the use of critical thinking teaching strategies among teachers who have teaching experience of 0-5 years, 10-20 years and above 25 years;
16. variation, if any, in the use of critical thinking teaching strategies between the teachers of high critical thinking (students) schools and low critical thinking (students) schools;

17. comparative home background of students having high and low levels of critical thinking.

1.3.2. Hypotheses of the Study

To realise the objectives stated above (except objective No. 1, 2, 12 and 17) the following hypotheses were tested:

1. There is no significant positive correlation between critical thinking appraisal score and intelligence test score eliminating the effect of socio-economic status score.

2. There is no significant positive correlation between critical thinking appraisal score and SES score eliminating the effect of intelligence test scores.

3. There is no significant positive correlation between critical thinking appraisal scores and academic achievement score in each of the school subjects, as well as academic achievement or as a whole eliminating the effect of intelligence test scores.

4. There is no significant difference between the mean critical thinking scores of rural and urban school students eliminating the effect of intelligence test scores.

5. There is no significant difference between mean critical thinking
scores of government and private school students eliminating the
effect of intelligence test scores.

6. There is no significant difference between boys and girls in their
mean critical thinking scores eliminating the effect of intelligence
test scores.

7. There is no significant difference between the mean critical
thinking scores of students coming from nuclear and joint families
eliminating the effect of intelligence test scores.

8. There is no significant difference between mean critical thinking
scores of Marathi speaking students and Konkani speaking
students eliminating the effect of intelligence test scores.

9. There is no significant difference of mean critical thinking scores
among Hindu, Christian and Muslim students eliminating the
effect of intelligence test scores.

10. There is no significant difference between the mean critical
thinking teaching strategy scores of Government and private
school teachers.

11. There is no significant difference in mean critical thinking teaching
strategy scores among Science, Social Studies and Language
teachers.

12. There is no significant difference in mean critical thinking teaching
strategy scores among teachers who have teaching experience of
upto 5 years, 10-20 years and above 25 years.
13. There is no significant difference between mean critical thinking teaching strategy scores of the teachers of high critical thinking and low critical thinking (students) schools.

1.3.3. Operational Definition of Terms.

1. Critical Thinking:

Critical Thinking for the present study is conceptualized as the ability to reason dialectically or logically in synthesizing multiple frames of reference to resolve new problems. The critical thinking skills addressed in the present study include inference, recognition of assumptions, deduction, interpretation, and evaluation of arguments (Watson and Glaser, 1980).

Revised Watson-Glasor Critical Thinking Appraisal was used to measure critical thinking of students. Hence, critical thinking was operationally defined as the score obtained by an individual on the Watson-Glaser Critical Thinking Appraisal.

2. Intelligence:

Culture Fare Intelligence Scale by Cattel et al was used to measure the intelligence of the students. Hence, intelligence was operationally defined as the score obtained by individual student on the Cattel Culture Fare Intelligence Scale.

3. Academic Achievement:

The score obtained by the students in different subjects in the S.S.C. examination conducted by Goa Board of Secondary and Higher Secondary Education in March - 1998 was considered as their academic achievement.
4. **Socio-economic Status:**

The Socio-economic status is a blend of two statuses social and economic. Socio-economic status would therefore, be a ranking of an individual by the society he lives in, in terms of his material belongings and cultural possessions along with the degree of respect, power and influence he wields in the society. In the present study the socio-economic status of the students was measured in terms of caste, education, occupation, monthly income, assets, position in the society and facilities available at home. The socio economic score of the students were the score obtained by taking the weightages assigned to various sub-categories under the seven variables mentioned above based on the scoring key/scheme developed/adapted by Pradhan and Behera (1997).

5. **Contextual Variables:**

In the present study, the students immediate setting (i.e., the school and the home) was considered.

(a) **The School Context**

i) **Location: Rural and Urban School:**

All the schools situated in rural areas (a rural area being so defined in the 1991 census report) are termed as rural schools in the study. On the other hand, the schools situated in urban areas (an urban area being so defined in the 1991 census report) are termed as urban schools.

ii) **Management: Government and Private Schools:**

The schools which are owned and managed by Government of Goa are the Government Schools and the schools which are owned and managed by the individual/voluntary agencies/Charitable trusts/NGO's/ but financially supported by the government of Goa are
considered as private schools in the study.

iii) Teaching Strategies:

The specific teaching behaviour exhibited by the teachers in the classroom while teaching different subjects which are relevant for the development of critical thinking were considered as the teaching strategies.

B. Home Background

Home background of a student in the present study include the following:

i) Parents education and occupation
ii) Economic status of the family
iii) Types of family and size of family
iv) Language (mother tongue)
v) Religion
vi) Facilities and practices in the home and surroundings.
and vii) Parents child and/or significant elder-child interaction.

1.3.4. Scope and Delimitation of the Study

The scope of the study covers a wide range. It studied the critical thinking abilities of the secondary school students of the state of Goa during the academic year 1997-98 in relation to different variables like intelligence, academic achievement, home background, nature and location of schools and teaching strategies. However, due to time and budgetory constraints the study was delimited on different aspects as follows:

1. The study was restricted to only the students of standard Xth.

2. Only the state (Goa) Government schools and those private schools
which receive grants-in-aid from the Government of Goa were included.

3. Detailed Home background of only those students who were having high and low level of critical thinking was studied.

4. The study was restricted to only the non-verbal intelligence of the students.

5. Only the marks obtained by the students in different subjects in the standard Xth examinations held in March, 1998 were considered as their academic achievement.

6. Only 21 out of 35 dimensions of Critical Thinking were included in the Critical Thinking Teaching Behaviour Inventory.

7. Critical Thinking in the present study is restricted to drawing of inference, recognition of assumptions, deduction, interpretation and evaluation of arguments as measured by the Watson-Glaser Critical Thinking Appraisal (1994).

It may be mentioned here that the findings of the present study can be generalised to the schools that were included in the study in particular and to the other schools in the state of Goa in general. Moreover, the findings can also be generalised to the schools in other states of India provided the environment and the characteristics of the students are similar to the schools/students included in the present study.