Chapter 3

Review of related Literature

3.0 Introduction

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REVIEW OF LITERATURE

3.0 Introduction

Before planning the details of a study, researchers usually dig into the literature to find out what has been written about the topic they are interested in investigating. Both the opinions of the expert in the field and other research studies are of interest. Such reading is referred as” review of the literature”.

In the present chapter, an attempt has been made to review the research works related to the present study that have been done in India and abroad. The evolved findings and extracts have also been systematically debated and discussed.

The studies have been reviewed are classified into the following sections:

3.1 Studies on Critical Thinking Ability.

3.2 Studies on Multimedia strategies

3.1 Studies on Critical Thinking Ability:

Chaudhary G G – (1983): has conducted research on “An investigation into the trends of creative thinking ability of pupils of age group 11+to13+in relation to some psycho-socio correlates “at SP University.

The objectives of study were (i) To prepare a reliable and valid creative thinking ability test (ii) To study the trend of critical thinking ability of pupils of different areas. (iii) To study the trend of critical thinking ability of pupils of different sex. (iv) To study the trend of creative thinking ability of pupils of age group 11 to 13 (v) To study the trend of creative thinking ability of pupils in relation to their SES,
n-Achievement, IQ parental behaviour, anxiety, vital v/s. conservation, flexibility v/s rigidity, subjectivity v/s emotional stability.

The creative thinking ability test was standardized on a sample of 1000 pupils of which 394 were found from urban areas and 606 were from rural areas. The percentile and percentile rank norms were established for different age groups. For measuring SES, Achievement, IQ anxiety, security-insecurity, personality traits and inventories were used, different persons standardized all these tools. Factorial design was used to study creative thinking ability in relation to various psycho-socio variables.

The major findings were: (i) There was no significant difference between the mean creative thinking scores of male and female children of rural and urban areas (ii) There was marked difference between the mean scores on the test of children of three age groups (iii) The higher the n-Chi, the higher was the creative thinking ability of the student. (iv) The student with high IQ did not have more creative thinking ability than the student of low IQ (v) The student belonging to the high parental behaviour group did not have more creative thinking ability than the student belonging to the low parental behaviour groups (iv) The student with low subjectivity had more creative thinking ability than the student with high subjectivity (vii) The students with high emotional stability had more creative thinking ability than the student with low emotional stability.

**Byrne, Jones (1984):** has conducted a study on “The effect of critical thinking skills instruction on achievement and attitude of elementary students differing in learning style preference” at Vergenia University. The purpose of this study was to determine the effect of teacher paced vs. self paced instruction of critical thinking skills on the achievement of higher leverl thinking process and student attitude in
elementary students with a high moderate, or low preference for teacher structured learning.

Fifth grade students (n=35) were randomly assigned to three groups in two elementary schools, two treatments and one control group using a random block design based on abilities or intelligence and verbal analogy achievement.

Findings of the study were: (i) the direct teaching of the skills rather than the methodology was the significant factor in greater achievement. Scores on measures of critical thinking skills not directly related to the instruction and program did not show significant differences between groups, suggesting no transfer occurred in the ability to perform thinking tasks not specially instructed. (ii) Although there were indications that a preference self paced self-structure learning resulted in higher achievement, the results were not statistically significant. A match between learning style preference and teaching methodology did not result in greater achievement. (iii) Attitude of students towards institutions of thinking skills not affected significantly by teaching methodology or by differing learning style preference.

**Werbback, Judith Rea (1984):** has conducted a study on “A Theoretical model for a staff development program for teaching elementary students. The process of education as a critical thinking skill” at Georgia University. The study was concerned with the creation of model for a staff development programme, which could prepare educators to teach elementary school students the process of evaluation as a segment of critical thinking skills the study included analysis and synthesis of theoretical considerations as well as suggested strategies for practical application.
The following conclusions concerning the process of evaluation were (i) the process of evaluation is an integral component of critical thinking. (ii) Thinking skills are basic to learning (iii) Specific strategies involved in critical thinking and the process of evaluation, such as question asking and the use of appropriate criteria can be learned. (iv) Thinking skills including the process of evaluation can be integrated into staff development programs and its educational progress.

Patel J Z-(1987): has conducted a research on “An investigation into the effectiveness of the creative thinking programme on the creative abilities of elementary children” at SP University.

The objectives of study were (i) To prepare standard creative thinking programmes in Gujarati for elementary school children (ii) To study effect of the programmes on the creative level of the children (iii) To study the effect of the programmes on the creative components like fluency, flexibility and originality. (iv) To verify whether the main effect of IQ was significant (v) To investigate the main effect of sex and (vi) To study whether there exist any interaction effect on the creativity and its components measure.

The eight classes of different schools selected from kheda district were equated on the basis on the basis of the scores made by the students on creative ability test prepared and standardized by J Z Patel. The creative thinking programme was translated into Gujarati. Out of 32 programmes, 18 were translated into Gujarati, Some other similar programme prepared by the investigator. The intelligence test prepared b y J Z Patel was also administrated to student of eight classes. Out of the eight classes, four were treated as experimental classes where the programmes were implemented. The remaining four classes were treated as control classes the 2x2x2 factorial design were used.
The major findings were: (i) the main effect of training given to the experimental group was significant for creativity and its two components measures fluency and originality. (ii) The research confirmed the effectiveness of creative thinking training in the Indian setting. In spite of big classes rigid classroom control, memorization and respect for teacher in comparison with American classes, the gain in creative thinking ability was noteworthy. (iii) The main effect of IQ was significant but sex was insignificant. (iv) The creativity training could be practically imparted to the children in a developing country like India.

Biswal J-(1988) has conducted a study on “Creativity in mathematics as a function of study habits and pupils perceptions of teacher’s impression about their performance in mathematics”

The results of the study were: (i) Pupils creativity in mathematics was found to be linear function of each of the variables study habits in mathematics and pupils’ perception of teachers’ impression about their performance in mathematics (ii) Pupils creativity in mathematics was also found to be function of a variable study habits in mathematics. (iii) A functional relationship was also found existed between pupils’ creativity in mathematics and the combination of study habits and achievement in mathematics (iv) Study habits in mathematics had more significant effect on creativity in mathematics.

Piyavadee Boonsathron-(1988): has conducted a research on “Creative Thinking Ability of students of higher secondary schools of Bangkok in the context of some psycho-social factors” at SP University. The objectives of study were (i) to prepare a creative thinking ability test. (ii) To study the main effects of sex, grade and socio economic status on the students. (iii) To study creative thinking in relation to student’s adjustment, anxiety and students self-done activities. The investigator
constructed and standardized a creative thinking ability test over a sample of 543 students of class X and XI of Bangkok. The tools used for collecting data were, (a) Adjustment problem inventory by J C Parikh and M T Patel. (ii) Test anxiety scale of children by H K Nijhwan (iii) Conventionalism scale by A S Patel. (iv) Self done activity scale by I A Vora (v) Socio economic scale by B V Patel and I A Vora. The 2x2 factorial designs were adopted to study the effect of independent variables. The major finding were: (i) There was no significant difference between the mean performance of boys and girls included in the sample (ii) There was no difference in creative thinking ability between students coming from high SES and low SES. (iii) The student of grade XI and high creative thinking ability than those of grade X (iv) The student with high adjustment level were superior to students with low adjustment level on creative thinking ability. (v) The student of grade XI and X was almost the same as far as creative thinking ability was concerned (vi) Students coming from high SES and low SES groups were almost the same as far as creative thinking ability was concerned. The interaction effect between grade and SES was not significant. (vii) The student with low anxiety level and higher creative thinking ability than student with higher anxiety level. The students of grade XI were superior in creative thinking ability to students of class X. The interaction effect of grade and anxiety was significant.

Chennault-(1989): has conducted research on “Enhancing Critical Thinking skills in gifted elementary school students” at Mississippi State University.

This study was designed to determine whether significant differences existence in the adjusted mean scores in critical thinking for a group of fifth grade and sixth grade gifted students who participated in critical thinking positive relationship between the Academic achievement scores and the scores on Critical Thinking Skills of B.Ed students of Mangalore University.
Rile-(1991) has done study on: “Teacher questioning for improvement of critical thinking skills “at Wisconsin university. The purpose of this study was to examine the impact of quality questions by a home economics teacher on critical thinking abilities and achievement scores of twelfth grade high school students. This study is based on a conceptual framework, which was developed to show relationship between the work of Dewey, tennis, Bruner and Bloom. A detailed three and one-half week curricular unit was developed for the study. The experimental design included an experimental group (41) taught with the use of questioning techniques and a control group (30) taught in a traditional manner, for null hypothesis were tested regarding difference in change of critical thinking scores or achievement scores of home economics students taught with or without the use of higher level questioning techniques. The Cornell critical thinking test measures of critical thinking and achievement. Findings confirmed that (i) The questioning technique did assist students to improve critical thinking ability for the experimental group (ii) No significant difference were found between the special and regular education students with in the experimental and control groups (iii) The questioning technique did not make a significant impact on students’ achievement scores.

Implication of the study were: (i) The correlation studies conducted in the area of critical thinking helped the researcher to indentify the relevant variables and also restrict to the essential and limited number of variables. The related literature also guided the researcher regarding classifying the variables like sex, intelligence and SES into independent, dependant and moderate variables. (ii) The studies conducted by McGarrity and others helped the researcher to consider the academic achievement as the dependant variable (iii) The researcher was able to acquaint with the names of different tools available regarding critical thinking skills such as
Morero-(1991) has conducted a research on “The role of thinking frames in developing teachers’ critical thinking skills and deposition “at Miami University. The purpose of this study was to determine the role of thinking frames in developing teachers’ critical thinking skills and depositions. The subjects were elementary teachers who participated in a ten-week in-service programme. Treatments were randomly assigned to three groups. The experimental group received instruction in Richard Paul critical thinking remodeling of lesson plans with the inclusion of a thinking frame, a graphic representation of critical reflection. The comparison group received the same instruction with the exclusion of the thinking frame. The base-line group was instructed using traditional approach that excluded both critical thinking skills and a thinking frame. Major findings of the study were: (i) the teachers who were taught in the experimental group did not obtain statistically different scores on the Ennis Weir critical thinking essay test than the teachers taught in the comparison or base line group. (ii) Teacher across groups showed no significant differences in how they perceived themselves as thinkers when measured by Edwards self concept as thinker scale (iii) The teacher in the experimental group reached a higher level of reflectivity as assessed by Van Manes levels of reflectivity than teachers in the comparison and base line groups. The result of one-way analysis of variance (ANOVA) at the 0.05 significance level revealed that there were no statistically significant differences. However, in the qualitative analysis of the data reached a higher level of critical reflection. Thinking frames seems to be process for helping teachers become more critically reflective.
Kezer-(1991): has conducted research on “Effects of computer technology and traditional methods of instruction upon critical thinking skills of teachers and students” at north Carolina University. The purpose of this study was to: (i) To investigate the effectiveness of computer technology in developing critical thinking skills of teachers and middle school students (ii) The influence of years of teaching experience and educational degrees held by the teacher upon teacher gains student gains were also investment test scores and critical thinking scores. The sample consisted of 20 classroom teachers and 449 fifth and sixth grade students at a middle school in rural Piedmont North Carolina. Ten teachers and 239 students were in classroom with computers, while the control group of 10 teachers and 210 students did not have computers. Findings of the study were: (i) At least for gain scores of the computer group with the control group indicated a significantly greater gain for computer students than non-computer students. Teachers gain were not significant (ii) A Pearson correlation revealed a significant inverse relationship between years of teaching experience and students gain scores. (iii) California Achievement test (CAT) scores were compared with scores on the Cornell Critical Thinking (CCTT). The result of regression analysis indicated that for all students in sample (n=100), the CAT reading scores was the best predictor of overall CCTT gain scores. CAT scores were less predictive at the sixth grade level than at the fifth.

Srikantaswamy-(1995) has conducted a research on “An Impact of a programme of critical thinking skills on the achievement of secondary school teacher trainees of Bangalore City”.

The major objectives were: i) To develop a tool to measure critical thinking skills among the secondary school teachers’ trainees of Bangalore city. ii) To develop a programme for critical thinking skills based on methods of teaching physics. iii) To
study the impact of the programme of critical thinking skills on the achievement of secondary school teacher trainees, in methods of teaching physics. iv) To find out the interaction of sex, intelligence, SES and critical thinking skills on the achievement of secondary school teacher trainees, in methods of teaching physics.

In the above study, the researcher has selected the college of education which are located in Bangalore city where the trainees who have taken the methods of teaching physics. Hence the above study involved purposive sampling technique. The size of the sample is 125 which included all the trainees who have taken methods of teaching physics. Investigator has selected Kuppuswamy SES scale modified suitably. To measure intelligence of the teacher trainees, the researcher used ravens Progressive Matrices, also prepared achievement test based on physics content from B.Ed syllabus following standardization procedure.

The following were the major findings: i) there was a significant difference between the pretest and post test mean scores of experimental and control group regarding critical thinking skills based on achievement in methods of teaching physics. ii) There was significant difference between the pre-test and post-test mean scores of achievement in methods of teaching physics of the experimental group regarding all the components of critical thinking skills. (iii) There was significant difference between the post tests mean scores of achievement in methods of teaching physics of the experimental group regarding all the components of critical thinking skills. (iv) There was no significant interaction between the nature of the test, sex, SES and intelligence regarding all the components of critical thinking skills. (v) There was no significant interaction between sex, SES and critical thinking skills with respect to achievement in methods of teaching of physics.
Anuradha A. Gokhale (1995): “Collaborative Learning Enhances Critical Thinking” at Western Illinois University, Macomb, Illinois. This study examined the effectiveness of individual learning versus collaborative learning in enhancing drill-and-practice skills and critical thinking skills. The subject matter was series and parallel dc circuits. A nonequivalent control group design was used in this study. The level of significance (alpha) was set at 0.05. A pre-test was administered to all subjects prior to the treatment. The pre-test was helpful in assessing students’ prior knowledge of dc circuits and also in testing initial equivalence among groups. A posttest was administered to measure treatment effects. The total treatment lasted for 95 minutes. In order to avoid the problem of the students becoming “test-wise” the pre-test and post-test were not parallel forms of the same test. The post-test score was use as the criterion variable. At first, a t-test was conducted on pre-test scores for the two treatment groups. The mean of the pretest scores for the participants in the group that studied collaboratively (3.4) was not significantly different than the group that studied individually (3.1). The post-test group’s procedure which is appropriate for this research design. In addition, an analysis of covariance procedure was used to reduce the error variance by an amount proportional to the correlation between the pre and posttests. The correlation between the pre-test and the post-test was significant (r=0.21, p<0.05). In this approach, the pretest was used as a single covariate ANCOVA analysis.

Sidney Audrey .H. (1996) Mississippi State University, United states have found out the effects of the inquiry method of teaching science on critical thinking skills, achievement and attitudes towards the science.

Melinda-(1999) has conducted a study on “The effects of the integration of thinking skills on pre-service teacher’s beliefs about mathematics and teaching mathematics” This study examined the effects of the integration of thinking skills
on pre-service teacher’s beliefs about mathematics and teaching mathematics. The study identified the beliefs of pre-service elementary teachers about mathematics at both the beginning and the end of a semester, identified changes in those beliefs, and examined the role of the integration of thinking skills played in affecting those changes. A written questionnaire designed to identify beliefs about mathematics and the teaching of mathematics containing close-ended and open-ended questions were administered to all the students enrolled in a required geometry course at the beginning of the semester. Eight students participated in a follow-up interview to clarify their questionnaire responses and to provide additional information concerning their belief. The results of this study are: (i) Beginning of the study one participant viewed mathematics as primarily procedural. By the end of the study this participant expressed an appreciation for a conceptual emphasis and favored the use of a variety of teaching techniques. (ii) A second participant entered the study with beliefs about mathematics and teaching mathematics that primarily aligned with the beliefs encouraged by NCTM. Her beliefs remained largely unchanged (iii) A third participant began the study with little confidence and increased and she expressed the belief that she was capable of teaching mathematics in the future.

Lee, Hea-jin-(1999) has conducted study on “The nature of the changes in reflective thinking in pre-service mathematics teachers engaged in student teaching field experience in Korea” The purpose of this study was (i) To document prospective teachers development of reflective thinking during the student teaching field experience (ii) The investigator was examined (a) student teacher main concern during their field experience and the changes in their concerns as they gained experience, (b) the change in depth of students teacher reflective thinking as they gained experience and (c) the changes in student teacher attitudes and beliefs
as they gained experience. The three main factors framing this study were: personal factors (such as personality, belief, attitudes, knowledge and ability) components of reflective thinking (including processes, attitudes, content and depth) and systematic aid for improving reflective thinking. The results of the study were: (i) Student teacher main concern during their field experience and the changes in their concerns as they gained experience. (ii) The changes in depth of students’ teachers’ reflective thinking as they gained experience (iii) the changes in students’ attitudes and beliefs as they gained experience.

Sumangala –(2000) has conducted a research on “A study of the factors affecting Critical Thinking Skills among the B.Ed students of Mangalore University “ at Mangalore University. The major objectives of the study were: (i) To determine the levels of Critical Thinking Skills among the B.Ed students of Mangalore University using a test on critical thinking Skills constructed by the investigator. (ii) To find out whether there was any difference in the critical thinking skills between the B.Ed students of Mangalore University, Selected under the Government quota and management quota seats. (iii) To find out whether there was any difference in the Critical Thinking skills between Male and Female B.Ed students of Mangalore University. (iv) To find out whether there was any difference in the Critical Thinking Skills between the B.Ed students of arts and science Stream of Mangalore University. (v) To find out whether there was any difference in the critical thinking skills between the graduate and post-graduate B.Ed students of Mangalore University. (vi) To find out whether there is any difference in the Critical Thinking Skills among the B.Ed students from the different colleges of education on Mangalore University. (Vii) To find out whether there is any relationship between the scores on critical thinking skills and the achievement score of the B.Ed students of Mangalore University. The sample was
selected randomly, from the four B.Ed colleges of Mangalore University. It consisted of 399 B.Ed students. The investigator constructed and validated the test on Critical Thinking Skills. The following were the major findings: (i) it was found in the study that the level of acquisition of Critical Thinking Skills among the B.Ed students of Mangalore University was not equally distributed. (ii) It was also found that the scores of female B.Ed students in Critical Thinking Skills were higher than those of male B.Ed students of Mangalore University. (iii) The study has demonstrated that there was no difference between the graduate and post-graduate B.Ed students of Mangalore University in terms Critical Thinking skills it was noted that the B.Ed students of science stream had higher score than the B.Ed students of the arts stream. (v) The study also showed that there was no relationship between the Critical Thinking Skills among the B.Ed students in terms of the type of the college. (vi) There was a significant positive relationship between the Academic achievement scores and the scores of Critical Thinking Skills of B.Ed students of Mangalore University.

Dayavathi-(2000) has conducted a research on “A study of Critical Thinking Strategy of secondary school teachers of Mangalore Taluk” at Mangalore University. The Major objectives of the study were: (i) To measure the opinion of the students about their teachers critical thinking strategies and to determine the distribution of scores. (ii) To construct an observation schedule and to measure the critical thinking strategies of secondary school teachers in classroom behaviour. (iii) To find out whether there exist any difference between the secondary school teachers of the Arts stream and science stream in critical thinking strategies. (iv) To determine the difference between male and female teachers in the case of critical thinking strategies. (v) To find the difference in scores of critical thinking strategies of teachers with higher educational qualification and those with
minimum educational qualification. The study was descriptive survey in nature. It involved three phases. In phase I variables involved in the study were selected and tool to measure the selected variables were constructed and validated. In phase II the samples was selected, which involved ten teachers each of six secondary schools of both rural and urban areas of Mangalore Taluk schools. They were selected at random from the list of schools available, out of which three were aided and three were Government schools. The sample consisted of five hundred teachers of those respective teachers at the rate of 50:1 In phase III the data collected was analyzed by using statistical procedure. The investigator constructed an inventory on Critical Thinking teaching Behaviour and an observation schedule to observe the critical thinking strategies of the teachers in classroom teaching. The following were the major findings (i) the study has demonstrated that the scores on critical thinking strategies of secondary school teachers and students were not equally distributed. (ii) It was also found that the scores of critical thinking strategies of secondary school teachers measured by the observation schedule were not equally distributed. (iii) It also showed that there was no significant difference in the mean scores of critical thinking strategies of teachers between arts and science streams and the male and female teachers. (iv) It was also found that there was no significant difference in the scores of teachers with higher educational qualification and the teachers with more teaching experience and those who had less teaching experience.

Myrtle Maria A C- (2001) has conducted a research on “The effect of the self designed instructional material on the selected Thinking Skills of the pupils of standard Eight of Udupi district “at Mangalore University. The major objectives of the study were: (i) To find out scores on the test on Thinking Skills of the pupils of standard Eight of Government High Schools of Udupi taluk and to compare the
mean of scores according to gender of the pupils and types of schools. (ii) To find out whether there exist any difference between the mean of scores of Boys and Girls on a) Observation b) Coding c) Comparison d) Classification e) Inference and f) Total scores on the test on Thinking Skills of Eighth Standard pupils of Government High Schools of Udupi taluk. (iii) To prepare self-designed Instructional Material in selected Thinking Skills of the pupils of standard eight of the Government High Schools of Udupi taluk as a suggestive measure. (iv) To find out the effect of the self-designed instructional material on the thinking skills among the pupils of standard eight of Government high schools. The sample selected for the study consisted of 292 pupils of standard eight of Kannada medium Government High Schools of Udupi taluk. They were of the both sex. The investigator was in the need of a test to measure the selected thinking skills of the pupils of standard eight of the Government high schools of Udupi taluk. The tool used in the study was, the test on thinking skills constructed by the investigator. The sample for the experimental method consisted of 31 pupils i.e. 12 boys and 19 girls of standard eight who secured the lowest mean scores among sex other different schools. The pupils were of 12 to 15 years of age from the Kannada medium. The following were the major findings: (i) the study demonstrated that the test on thinking skills effected significant difference between the means of score of Boys and girls on the total scores among the pupils of standard eight of the Government High Schools of Udupi taluk. (ii) The investigator noted that it was possible to prepare the instructional material on selected thinking skills based on wraths teaching for thinking, in Kannada, Social Science, science and mathematics for the pupils of standard eight of the Government high school using the curriculum prescribed by the Government of Karnataka. (iii) There was a significant difference between the mean of scores of the pre-test and the post-test on a) Observation b) Coding c) Comparison d) Classification e) Inference and f)
Total scores on the test on thinking skills of eight standard pupils of Government high Schools.

*Allmaras, Devon (2001)*, Colorado State University, United States has studied on the effects of thinking skill training on high school students on problem solving abilities.

*Anitha Jasmine-(2002)* has constructed a research on “Effectiveness of specially prepared instructional material on the thinking skills of investigation and Creativity Thinking ability among the pupils of standard six” at Mangalore University. The major objectives of the study were: (i) To find out the distribution of scores on the test for Thinking skills by investigation among the pupils of standard six of the Government primary schools of Mangalore taluk and to compare the mean of scores of Boys and Girls and different types of schools. (ii) To prepare special instructional material on the Thinking skills of investigation for the pupils of standard six of the Government primary schools. (iii) To find out the effect of specially prepared instructional material on the creative thinking ability among the pupils of standard six of the Government primary schools. The investigator used a pre-test and post-test single Group Experimental design in the study. The sample selected for the study consisted of 230 pupils from nine different Government primary schools of Kannada medium among them 14 boys and 8 girls of the Government primary school. The following tools were used in the study: a) A test on the Thinking skills of investigation constructed by the investigator, b) A test on Verbal and Non-verbal Creative thinking by Baquer Mehdi c) Instructional material to develop the Thinking skills. The major findings were: i) there was a positive significant difference between the means of scores of the pre-test and post-test on, making observation, stating hypothesis, identification of what is already known about the concept, Explanation of the confusion about the concepts,
providing solution to the confusion. (ii) There was a significant difference between
the means of scores of the pre-test and post-test on explanation of the confusion
about the concept and providing solution to the confusion. (iii) There was no
significant difference between the means of scores of the pre-test and post-test on
fluency and originality. (iv) There was a significant difference between the means
of the scores of the pre-test and post-test on the dimension of elaboration of the test
on non-verbal Creative thinking among the pupils of standard six of the
Government primary schools.

Klement & Teixeira-(2002) has conducted a study on “An experimental study
comparing critical thinking growth and learning styles in a traditional and
workshop based introductory mathematics course”

The purpose of this study was to compare gain in critical thinking skills and in
overall achievement in a traditional and workshop based introductory mathematics
course, called Quantitative Reasoning; and to identify if possible, the learning
styles of the students who performed better in either format. The subjects for this
study were selected from undergraduate students taking QR during the spring 2001
semester, at a major research university in the northeastern part of the United
States. Initially, a total of 150 students enrolled in QR of these, 83 were enrolled in
lecture (control group) and 67 were enrolled in workshop (experimental group ) . A
quasi-experimental pretest-post test design was used since students self selected
the format in which they registered. The students both groups were pre-tested using
form ‘A’ of the Watson-Glaser Critical Thinking Appraisal (WGCTA), and were
post-tested using form ‘B’ of the WGCTA. The Kolb learning style inventory was
used to determine the learning style of each subject. The results of this study were:
(i) There was no statistically significant difference between the treatments in
critical thinking achievement when comparison made by gender or school within
the university. (ii) There was a statistically significant difference between the treatments by class level. (iii) There was no statistically significant difference between the treatments in overall achievement (iv) There were no statistically differences between the treatments in critical thinking achievement, or overall achievement for each type of learner.

**Baugh-(2002)** has conducted a study on “Integrating critical thinking skills into the mathematics curriculum of the Maricopa community college”. The purpose of the study is to define critical thinking and its characteristics that are appropriate for integration into the mathematical curriculum of the Maricopa Community college. The results of this study are: (i) Through the use of the Delphi technique the study determined that critical thinking was a process that evaluates information and ideas, distinguishes between relevant and extraneous information, (ii) Determine whether a conclusion is warranted based on observations, experience or reflection.

**Fayza . S . AL-Hammadi: (2009)** Probed his investigation on “The impact of multimedia on critical thinking and writing of Saudi secondary school students”.

The study compared the critical thinking in two writing samples (essays) from adolescents who attended two Saudi secondary schools for boys and girls. The result demonstrated gender-specific effect of using computers than those who did not use computer to write and received higher ratings on a structured rubric girls scored identical grades in both conditions (handwritten and computer ) and performed consistently at par with boys using computers .

**Dr. Harish G.C (2011).** Has conducted the Study on “impact of integrated critical thinking skills on achievement in mathematics of secondary school students. The objectives of the studies are 1. To study the impact of integrated critical thinking skills on achievement in mathematics. 2. To determine the relationship between the
integrated critical thinking skills and achievement in mathematics with respect to gender. 3. To find out the difference in the critical thinking skills and achievement scores based on the gender. The findings are that there is significant difference between the post test achievements of control and experimental group. There is no significant difference between mean scores of boys and girls in the post test achievement. There is significant interaction between the group and gender on post test achievement. There is significant difference between the mean scores group and gender in their post test achievement with respect to total integrated critical thinking skills. There is significant interaction between the group and gender on total integrated critical thinking skills on achievement after the intervention programme.

3.2 CONCLUSION

The review of related literature was helpful in getting the clear picture of classroom researches in the area of critical thinking skills. It was helpful in identifying the components of critical thinking skills and suitable strategy that can be used in the process of instruction.

3.3 Studies on multimedia strategies

Rajaswaminathan (1998) conducted a” Study on impact of multimedia package on the teaching of commerce” to selected variable objectives of the studies were to find out the effect of the inquiry training model on the student’s academic achievement , inquiry skills, creativity, autonomy in learning, tolerance of ambiguity and tentative nature of knowledge . The interaction effect to treatments and gender on the student’s academic achievement inquiry skills creativity, autonomy in learning, tolerance of ambiguity and tentative nature of knowledge. Findings of the study were, the inquiry training model was found to be more
effective in promoting academic achievement, inquiry skills, creativity and autonomy in learning, tolerance of ambiguity and tentative nature of knowledge of the students. The interaction effect of treatments and gender on academic achievement, inquiry skills, creativity, and autonomy in learning, tolerance of ambiguity and tentative nature of knowledge of the students under the inquiry training model was not found significant.

Significant and mutual relationship was found among academic achievement, inquiry skills, creativity autonomy in learning, tolerance of ambiguity and tentative nature of knowledge of the students taught through the inquiry training model.

**Valerie Frear and John J Hirschbuhl (1999):** has conducted study on ”Does interactive multimedia promote achievement and higher level thinking skills for today’s science students? This study validates the effectiveness of the IMM treatment in significantly increasing student achievement and problem solving skills in environmental science.

**Linda Cooper (1999)** has conducted a study on” testing students online a dilemma for instructors of online classes” is whether to utilize online testing or require students who come to the campus for taking exams. The findings of the studies were: The objectives online testing can be tedious to set up, when they are automatically graded, they provide intermediate feed back to the students and also eliminate instructor grading. The consequence of online though is that the instructor never be present if the students enrolled in the class actually took the test. This strategy seems to satisfy most of the students.

**Yuen-Kuang Cliff Liao (1999):** has probed investigation on the topic” Effects of Hypermedia on Students' Achievement: A Meta-Analysis “. A meta-analysis was performed to synthesize existing research comparing the effects of hypermedia
verse non hypermedia instruction (e.g., CAI, text, traditional, videotape instruction) on students' achievement. Forty-six studies were located from three sources, and their quantitative data were transformed into Effect Size (ES). The overall grand mean of the study-weighted ES for all 46 studies was 0.41. The results suggest that hypermedia instruction is more effective when there is no instruction for the comparison group or when the comparison group used videotape instruction. However, CAI and text instructions are slightly more effective than hypermedia instruction. As a whole, the results of this analysis suggest that the effects of hypermedia instruction on students' achievement are better than the other group.

James Meckleburger (2000) conducted a survey of the research on the “effectiveness of computer assisted Instruction to investigate the effects of the technology on the learning process”. This study examined teacher-student interactions in a computer laboratory. It was found that the physical proximity in the laboratory and in the regular classrooms between the student and the teachers has its impact on the performance of the learners.

Chu and Chen (2000) developed a multimedia prototype on serve of badminton and conducted an experimental research in elementary school classes (sixth grade) to explore whether the multimedia material is a helpful tool to motor skills learning. The multimedia computer-assisted instruction group had better results on the cognitive test but not on the motor skill test than the traditional instruction group.

Panda, Subhas Chandra and Chaudhary, Jayakrushna (2000). Studied about “The effect of computer assisted learning (CAL) in achieving high cognitive skills”. Objectives of the studies were to determine the degree of attainment of cognitive skills through computer assisted learning (CAL) compared to traditional
approach to teaching to compare that effect of CAL on the learning achievement of boys and girls. Findings of the studies were computer assisted learning (CAL) resulted in greater learning achievement in all the hierarchies of cognitive domain. Male students were found to be superior to female students in learning physics.

Thilaka Suresh and Pramila (2000) investigated “the use of computer multimedia programme in learning trigonometry among high school students” the objectives of the study were 1. To find out influence of computer multimedia program on the achievement in mathematics among high school students. 2. To study the change in their attitude towards mathematics after learning trigonometry through computer based multimedia and text based self study material. 3. To find out the significant difference in achievement in mathematics between high achievers and low achievers from both the experimental and control groups. 4. To find out the relative retention of learning in mathematics between the experimental and control groups. Findings were: There is no influence of computer based multimedia program on the achievement in mathematics among high school students. There is significant change in their attitude towards mathematics after learning trigonometry through computer-based multimedia and text based self study material. There is no significant difference in the achievement of mathematics between high achievers and low achievers for both experimental and control groups.

Timothy (2001) has conducted the study on “multimedia enhanced educational products as a method of facilitating greater depths of learning”. The promise of multimedia as a tool for evaluating learning is indeed intoxicating. The prospect of actively very compelling and means of facilitating learning for a large percentage of our students. The enthusiasm must however be tempered by two sobering facts. There is a little evidence in the support of the value of multimedia
as an enhancement to the learning environment. The cost of producing multimedia production is so very great that should it not prove effectively, our educational system could be seriously imparted. The results of this experiment do in fact lend support to the value of multimedia enhanced educational products as a method of facilitating greater depths of learning.

Singaravelu (2002) has conducted the study about the “Impact of internet learning research methodology”. The findings of the studies were; B.Ed students have poor average scores in learning research methodology through conventional approach in B.Ed Government college of Education, Orthanadu. There is significant difference between the control group and experimental group in learning research methodology. Learning research methodology through internet is more effective than conventional approach.

Khadiravan and Suresh (2002) studied on “Effect of computer assisted instruction on self regulated learning” Application of technology in teaching – learning for improving academic skills has become one of the main areas of focus of educational research. So the findings of his study shows that the technology can enhance the quality of education.

Vasanthi and Hema (2003) Probed into “the effectiveness of teaching chemistry for 1 year B.E students through computer assisted instructions”. Objectives of the studies were to study the effectiveness of teaching chemistry through computer assisted instructions over the traditional teaching method. To find the effectiveness of the computer assisted instruction over the traditional teaching method in the pre test scores. Findings of the studies were, there is significant difference between the mean gain score of the control group taught through TTM and the experimental group administered by the CAI in all units put together.
There is no significant difference between the mean scores of pre test of control group taught through TTM and experimental group administered by CAI in all units put together. There is significant difference between the mean scores of post test of control taught through TTM and experimental group by CAI to all units put together.

D.Idayavani, S. Shanthi (2003) conducted a study on “Impact of video assisted instruction in school. The objectives of the studies are 1. To compare the achievement of students through video assisted instruction and traditional method of teaching. 2. To find out the level of achievement of boys and girls through VAI and TM. The findings of the studies are 1. There is a significant difference between the post test scores of control and experimental group. 2. There is a significant difference between the achievement of boys and girls in the post test scores made through VAI.

Edward, William Benjamin and Shiva Kumar (2003) Analyzed that “multimedia enhances effective self learning impact of multimedia on physics” the web dictionary can be given for each lesson for the understanding of difficult words.

Ponnuswamy (2003) Tried to study about the “the use of instructional media in classroom activities by primary school teachers” objectives of the study were to find out the percent age of primary and upper primary school teachers utilizing media in their classroom activities. Finding of the study were

a) Most of the primary school teachers were not utilizing bulletin board, transparencies, slides, audio tapes and TV in their school.

b) Most of them were utilizing models and newspapers in their classroom activities.
c) There should be proper training for teachers to use the media in enriching the classroom activities.

**Minliu (2003)** studied on enhancing learning, cognitive skills through multimedia design” and findings shows that multimedia design has enhanced cognitive skills among high school students.

**Faculty of educational studies. University of putia Malaysia (2003).**

Studied about “Qualitative findings of student’s perception on practice of self regulated strategies in online connectivity discussion.

This study aims to address qualitative findings of a study on self regulated learning strategies conveyed through the proposed interactive online connectivity discussion of eight weeks for students were significantly succeed admirably after the process.

“All most all the studies have shown positive correlation between the subject matter and multimedia package or computer strategies use in teaching learning process.

**Nirmala Sundaraj and Annaraja (2005)** conducted a study on” Effectiveness of power point presentation in teaching zoology for higher secondary students”. The major findings were there was significant difference between the pre-test and the post-test scores of the students. There was significant difference pre-test and post-test scores of the students in attainment of knowledge, understanding and skill objectives. That is experimental group students are better than the control group students.

**Apostolos Steiskos, Panagiotis Anton, Athanasios Papaioannou, Konstantinos Laparidis (2005):** Has conducted on the study on “Effects of multimedia computer-
assisted instruction (MCAI) on academic achievement in physical education of Greek primary students”

Antony Gracious (2005) conducted a study on “Development of hypermedia learning package in science for IX standard students and its effectiveness”. The major findings were the experimental groups obtained a higher mean than the Control group. The sex wise comparison is insignificant. There is no significant association between the gain score and the hours of study of the control group students and there is no significant association between the gain score and the hours of the experimental group students.

Subasri (2006) conducted a study on “Accessibility of power point presentations among high school and higher secondary school teachers in classroom teaching”. The major findings there is high significant relationship between the fundamental knowledge of computer among the teachers power point accessibility in classroom teaching. Urban teachers are found to utilize power point presentations more effectively in classroom teaching when compared to rural teachers. There is no significant difference between the high school and higher secondary school teachers in utilizing the power point presentation in classroom teaching.

Itzhak Weiss, Bracha Kramarski and Shirit Talis (2006) has conducted the study on “Effects of multimedia environments on kindergarten children’s mathematical achievements and style of learning”: The purpose of the study is two-fold: (a) to investigate the effects of learning mathematics with multimedia embedded in different styles of learning (cooperative learning versus individual learning) in kindergarten on students’ mathematical achievements; (b) to examine students’ preference for style of learning with computers in kindergarten. Participants were 116 students (girls and boys) who studied in kindergarten
classes. One group was exposed to multimedia embedded in cooperative learning (CL), the second group was exposed to multimedia embedded in individual learning (IL) and the control group (C) was not exposed to multimedia. Findings indicated that the CL and IL students significantly outperformed the CL group in mathematical achievement. The IL students further improved their mathematical skills at the higher level, while the CL students further increased their positive attitude about cooperative learning.

Chen and Rong - Ji (2006) conducted a study on power and reason: The construction of a mathematics teacher’s pedagogical discourse and practices. The findings of the study can contribute to a better understanding of how a teacher’s construction of his pedagogical conceptions and practice is influenced by the social embedded within a particular network of power relations might be challenged.

R. Gnanavedan, V. Nimavathi (2008) : Conducted the study on “effectiveness of multimedia programme in teaching science. The objectives of the study are 1. To find out the effectiveness of computer multimedia programme in teaching of science at secondary level. 2. To compare the effectiveness of computer multimedia programmes in teaching of science with traditional method of teaching science. The findings of the study are there is significant difference between the experimental group and controlled group in the achievement of science at the post test level.

Mai Neo and Tse-kian Neo (2009) investigated on the topic “engaging students in multimedia mediated constructivist learning student’s perceptions for the students from the faculty of management the faculty of information and faculty of engineering comprising 53 students in number. The findings showed that
multimedia has enhanced students’ high level motivation and self esteem and enhanced the better understanding of the topic.

**Syaza Hazwani Zaini, Siti Zalina Mokhtar & Mokhtar Nawawi (2010):** Has investigated on the topic the “effect of graphic organizers on students learning in school”. The finding of the studies are graphic organizers had effect on the improvement of students comprehension, performance and motivation in learning.

**Hamizer B Mohb Sukor, Dr. Baharuddin B Aris, Mohammad B Bilal Ali (2010)** has conducted a study on “upgrading critical thinking skills via an interactive, inquiry based learning multimedia courseware: a conceptual background”. The study is aimed at investigating the feasibility of providing students with an alternative mode of enhancing critical thinking skills through interactive multimedia driven, inquiry based learning approach. The finding shows that students learnt through interactive multimedia approach showed higher performance in achievement and critical thinking skills.

**Dr. E. Ramganesh (2011):** Has conducted study on “Effect of E -graphic organizers on the achievement of class 12th students with learning difficulties in organic chemistry” objectives of the study are 1. To identify the students of class XII having learning difficulties in organic chemistry. 2. To develop and validate e-graphic organizers in organic chemistry for these students 3. To determine the effectiveness of the e-graphic organizers with the performance of these students in organic chemistry. The finding of the study infers that e-graphic organizers influenced the learning in the organic chemistry among the students of XII grade with learning difficulty.
Oktay AKBAS and Huseyin Mirac PEKTAS (2011) conducted his study on “The effects of using an interactive white board on the academic achievements of university students”.

The findings shows that there is no significant difference was found between academic achievements scores of experimental students who were engaged in both interactive white board and late practices and those of control groups who underwent only lab practices.

Sawsan Nusir, Izzat Alasmadi Mohammed Al-Kabi fathima Sharadgah (2012): Has probed his investigation on “Studying the impact of using multimedia interactive programs at children ability to learn basic math skills”. The purpose of this study is to investigate the impacts of utilizing multimedia technologies on enhancing or not, the effectiveness of teaching students at early stages in Jordanian primary schools. Results showed that multimedia enhanced methods of teaching are effective to teach math skills. Results also showed that there is no significant difference in learning and knowledge skills and information absorption based on gender distribution where results comparison between little boys and girls showed no significant difference in their learning skills.

P.Karthikeyan, S. Shanthi (2012): Has conducted the study on the “Effect on teaching science through projected and non projected aids among secondary students. The objectives of the study are 1. To find out the effect of using projected aids for experimental group and non projected aids for controlled group on the achievement in science in different learning objectives such as Knowledge, understanding, application and skill. 2. To find out the effect on achievement in science on the basis of parents occupation and educational qualification. 3. To compare the effect of using projected and non projected aids for experimental and
control group on achievement with respect to the learning objectives, parents occupation and educational qualification.

The findings of the study are 1. Experimental groups scored significantly higher than control group students in the post test with respect to learning objectives, four units, parent’s occupation and qualification. 2. Experimental group scored than the control group in all the learning objectives except skill. 3. Post test experimental group students whose parent’s education and occupation scored significantly higher than the control group students. 4. There is no significant correlation between the pre and post test scores of the control group students whereas there is significant correlation between the pre and post test scores of the experimental group studies. 5. Pre and post test scores of the control and experimental group students with respect of learning objectives, parent’s education, parent’s occupation and lessons are not significantly correlated.

**Mai Neo, KenTse-kian Neo and Heidi Yeen-Ju-Tan (2012) investigated on “Applying Authentic learning strategies in a multimedia and web learning environment (MWLE): Malaysian students’ perspective “shows that student learning was enhanced in MWLE had increased their authentic learning and also strategies used were effective in enhancing learning and understanding of the concepts among the students.

### 3.4: COMPILATION OF STUDIES

Faculty of educational studies. University of Putia Malaysia (2003), Nirmala Sundaraj and Annaraja (2005), Antony Gracious (2005), R. Gnanavedan, V. Nimavathi (2008) MaiNeo and Tse-Kian Neo (2009), Syaza Hazwani Zaini, Sita Zalina Mokhtar & Mokhtar Nawawi (2010), Hamizer B Mohb Sukor, Dr. Baharuddin B Aris, Mohammad B Bilal Ali (2010), Dr. E. Ramganesh (2011), Sawsan Nusir, Izzat Alsmadi Mohammed Al-Kabi fathima Sharadgah (2012) showed IMMS were effective in helping the students in developing critical thinking ability and also do well in achievement. But the multimedia strategies does not affect the achievement is contradicted by the study conducted by Rile (1991) in which the questioning technique using Multimedia did not make a significant impact on students achievement scores. The study conducted by Morero (1991) also contradicts that the teachers who were taught using thinking frames using multimedia did not obtain statistically different scores than baseline group. But however in the quantitative analysis of the data reached a higher level of critical reflection. Thinking frames using Multimedia seems to be the process for helping teachers become critically reflective. The study conducted by Klemont and Teixeria (2002) also in the line of contradiction, the finding of their study reveals that there was no statistically significant difference between the treatment in critical thinking achievement or overall achievement of the learner. The study conducted by Thilaka Suresh and Pramila (2000) also supports the contradiction through their study findings that there was no influence of computer based media program on the achievement in mathematics among the high school students. But however there is a change in their attitude after learning through computer based multimedia program. This may be due to self learning material which is used in the workshop course was not self sufficient and might not contributed to the development of critical thinking ability and enhancement of achievement in their respective subjects.
The Studies conducted by Chaudhary GG (1983), Patel JZ (1987), Piyavadee Boonsathron (1988), Srikanta Swamy (1995), Dayavathi (2000), Klement and Teixeira (2002) reveals that there is no significant difference between the post tests mean scores of boys and girls with respect to their achievement in their respective subjects and also in their critical thinking ability that means both the boys and girls are equally well performed in their achievement and development of critical thinking abilities it may be because of the usage of the interactive multimedia strategies. This is contradicted by the study conducted by Myrtle Maria A.C (2001) which reveals that there was significant difference between the mean scores of boys and girls on the total scores. The study conducted by Fayza, S. Al-Hammadi (2009) also falls in the line of contradiction that the girls had scored better than boys. The study conducted by Panda, Subhas Chandra and Chaudhary, Jayakrushna (2000) also supports that male students are superior to girls in learning physics. The study conducted by Sumangala (2000) also in line that the scores of female B.Ed students in critical thinking skills were higher than male B.Ed students of Mangalore University.

The studies conducted by Sumangala (2000) and Harish G.C (2011) reveals that there was a significant positive relationship between achievement scores and critical thinking skills of students.

The study conducted by Srikanta Swamy (1995) shows that there was no significant interaction between the nature of the test, sex, SES and intelligence regarding all the components of critical thinking skills and also There was no significant interaction between sex, SES and critical thinking skills with respect to achievement in methods of teaching of physics which is contradicted by the study conducted by Harish GC(2011) with the findings that There is significant interaction between the group and gender on total integrated critical thinking skills.
on achievement after the intervention programme. There is significant interaction between the group and gender on total integrated critical thinking skills on achievement after the intervention programme.

The findings of the review of the related studies made the researcher feel that further studies need to be undertaken so as to investigate the effect of interactive multimedia strategies with respect to achievement and critical thinking and also in relation to gender and intelligence in India, because still there is no clear picture about the relationship between multimedia strategies on critical thinking skills, achievement, gender and intelligence as the results are contradictory.