CHAPTER II

REVIEW OF LITERATURE
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CHAPTER – II
REVIEW OF LITERATURE

2.1. CHAPTER PREVIEW

The researcher makes an attempt to present a brief review of the relevant literature at different levels of education. Review of related literature pertaining to a problem makes the researcher familiar with the summary of previous research and the writings of recognized experts with what is already known, what is still unknown and untested and thus provides a background for development of the present study and brings the researcher to the proximity of the solution. She also reviews the related resources for learning various academic subjects.

The review of the literature is a valuable guide in defining the problem, recognizing its significance, suggesting promising data gathering devices, appropriate study design for the sources of data. A careful review of research journals, books, dissertations, thesis and other sources of information on the problem to be investigated is one of the important steps in the planning of any research study. Since effective research is based upon past knowledge, this helps to eliminate duplication of what has been done and provides useful hypotheses for investigation.

The researcher presents a brief review of the relevant literature on the status of the technology oriented learning at different levels of education. She also reviews the studies related to the use of outdoor learning resources for learning various academic subjects. The research studies abstracted here includes reported problems and closely related problems, samples studied, hypothesis tested.

According Roblyer et al (1997) the goals of education begin to change to reflect new social and educational needs, teaching strategies also change and so, consequently, do strategies for integrating
technology into teaching and learning. Education should emphasize more general capabilities for “learning to learn” that will help future citizens to cope with inevitable changes. Instead of learning specific items of information, they must emphasize training in ways of acquiring, sorting through and using information.

There are many studies abroad, using PLM (programmed learning materials), CAI (computer assisted instruction) and multimedia package methods to enhance science learning. In India less number of studies is available on multimedia. So the researcher had taken this study. Several research studies have shown the effectiveness of programmed learning material (PLM), computer assisted instruction (CAI) and multimedia package (MMP) to be significantly useful in teaching as well as learning. There are multimedia studies related to biology in India but they are less when it is compared to foreign studies.

2.2. STUDIES IN INDIA

Various studies are conducted in India regarding PLM, CAI and Multimedia packages in relation to learning all the subjects. There are twenty nine studies on PLM, fourteen studies on CAI and fifteen studies on Multimedia packages are given.

2.2.1. STUDIES RELATED TO PROGRAMMED LEARNING METHOD

Studies conducted on different subjects in relation to PLM and conventional teaching. The results of the studies are in favour of the PLM.

Kulkarni and Dewan (1967) tried to apply the principles of programmed learning to television lessons. The TV presentation of a question followed by answers from the students and the feedback enabled the students to score much higher.
Kulkarni and Mullick (1968) planned a correspondence lesson unit in statistics, both in a conventional way and the programmed way. The results were in favour of the programmed lesson.

Sarkar (1969) used programmed material for industrial training in his experiments with workers of Gujarat State Fertilizers Corporation (GSFC) and found it quite effective.

Shah (1972) conducted a study on programmed learning for mathematics students of Class V in Gujarat state. He developed programmed learning material on various units of mathematics syllabus of Class V. The total time for completing the programmed learning material was 24 hours and 40 minutes. The reactions of the students and the teachers were favourable.


Gautham (1986) conducted a study to find out achievement in relation to creative thinking and level of aspiration, while using Programmed instructional material.

PLM was found to be as effective as conventional method in terms of achievement of students was the subject of study by Chandrakala (1976) and Govinda (1976). Few researchers conducted studies to find out the achievement level and favourable opinion towards PLM by Chauhan (1973), Mavi (1981), and Davies (1982).

Efficacy of different instructional media in the teaching of Science to the pupils of class VIII in relation to certain variables was
tried by Desai (1985). The programmed learning approach was more effective than traditional way of teaching science. The use of instructional media indicated the possibility of improvement in the methodology of science teaching, raising the standard of science education in secondary schools.

Shihabudheen (1988) tried to find out the comparative efficiency of using Programmed Instructional materials and ordinary class room teaching procedure for Arabic instruction in primary school. There was no difference in the case of high achievement and the programmed learning and traditional method was equally effective. Rao (1983) and Dipika Bhadresh Shah (1997), also find out the efficiency of the Programmed Learning method over the conventional Method in the instruction of Mathematics in school education.

Jyoti Tare (2001) prepared Branching Variety of Programmed Instruction Material as Diagnostic and Remedial tool in Chemistry for Secondary Classes and studied the effectiveness. The achievement of the experimental group was found significantly greater than the achievement of the control group. No significant difference was found in the achievement of boys and girls of rural and urban areas.

Sharma Sumita (2005) prepared instructional package to teach environmental studies to students of Std. VII and to determine the effectiveness of the instructional package in promoting better understanding of the environment. The instructional package was found effective in promoting a better understanding of the environment. The analysis of the responses of the students through the interview schedule revealed an increased sensitivity towards environmental concerns of the environment.

Jijish Elias (2009) prepared a Mathetics in the field of IUPAC naming and to find out the effectiveness of the programme through achievement test in chemistry at higher secondary level. In the
experimental method (N=30) a sample was selected into two groups. The computed value of t is 3.8147 which is higher than the tabulated value 2.05. The result indicated that the experimental group used mathetics programme (PLM) learning significantly differed over the control group used the conventional teaching.

2.2.2. STUDIES RELATED TO COMPUTER ASSISTED INSTRUCTION

Various researchers developed CAI packages and conducted studies on the effectiveness of CAI over traditional method of teaching. All the studies helped the students to gain more scores in their achievement level.

Palaniappan (1990) investigated the effectiveness of computer assisted instruction (CAI) in learning triangles as compared to traditional method. The result shows that learning through CAI enhanced better learning than the traditional method in their achievement scores. There was also a significant difference between the low achievers of both the groups that indicated that learning through CAI enhanced better performance among the low achievers than the traditional method of teaching. The author thus claimed that there was an overall improvement in performance while teaching through CAI.

A computer assisted instruction (CAI) was developed in the subject Physics at plus II level by Prabhakar (1995) and found out the effectiveness of the package over traditional teaching method. The result reveals that the achievement increases due to the package.

A Computer Assisted Learning Material (CALM) on Rhymes has been developed by Anshuman Das (1998) in different modes such as text, graphics-text, text-music, graphics text music, and graphics-text music-recital modes and to find out the effectiveness of CALM prepared in different modes for learning the Rhymes in terms of word meaning (lexicon), analytical understanding, comprehensive understanding,
writing ability, recitation ability and LSRW ability. The study found that composite modes of presentation may not ensure higher cognitive language learning, further, intelligibility of a message is a function of sender, message, medium, mode, receiver, and the environment.

Anjali (1999) developed a CAI package in the subject chemistry for standard XI science students and studied the effectiveness in terms of instructional time and achievement of students. Also, she studied the effect of software package on students’ achievement in relation to students’ intelligence level, motivation level, and attitude towards the package and the attitude of the students and teachers regarding the effectiveness of the CAI package with respect to contents, presentation, examples, illustrations, graphs and figures, evaluation items, utility of software. The software package was found to be effective in terms of academic achievement of the students. The students and teachers were found to have favourable opinion towards the software package. There was an interaction effects of intelligence quotient, motivation and opinion of students found on their academic achievement.

A Computer Assisted English Language package was developed by Munther (1999) in teaching for VIII standard Gujarati medium students and to find out the effectiveness of the package over traditional language teaching on student achievement in vocabulary, grammar and comprehension with respect to their intelligence, motivation and attitude. The students of the experimental groups performed better than the students in the control group. The study reveals that the package helps the students to achieve more in learning vocabulary, grammar and comprehension. It helps the students learn better because it provides them with a lot of freedom and responsibility to learn at their own pace. The students were found to have positive attitude towards Computer Assisted English Language instruction.

Goel et al (2000) conducted a project- Implementing CAI in Schools to study the effectiveness of CAI (Satellite, Solar System &
Magnet (VIII), Pollution, Electricity, Thermal Conductivity, and Biogas (IX), Organic Chemistry, Optics, Periodic Table and Chemical Bonding (XI) in terms of achievement of the students. Also an attempt was made to train teachers in the use of CAI on optics, thermal conductivity, periodic table and chemical bonding, solar system, electricity, magnetism, accountancy, photosynthesis, geometry, Rhymes, English, cell division and balgeet. It was found that the packages implemented were found to have favourable reactions of students and teachers towards the CAI.

Sanjna (2001) prepared a CAI package and compare the effectiveness of CAI and CMI on Pupil's achievement in Science, their self concept and study involvement for the class VIII level. The result reveals that both CAI and CMI were found to be contributing significantly towards the achievement of pupils in science, in developing their self concept and in increasing their study involvement.

A CAI package was developed by Selvi (2001) in nuclear physics and found out the effectiveness of the package method over traditional teaching method among higher secondary students. The difference between traditional teaching method group and CAI group, calculated ‘t’ value was 11.385 which is more than the table value. Hence CAI method has helped the students to gain more marks in the achievement test in nuclear physics than the traditional teaching method.

Sivraj (2004) developed a CAI package in biology and find out its effectiveness over traditional teaching methods among secondary level students. The study reveals that the CAI students demonstrated significantly higher achievement gains in biology. The variables self-esteem, attitude towards Biology and computer were influenced by the CAI.

Banerjee et al (2005) designed to evaluate ways to improve the quality of education in urban slums. A remedial education program hired
young women from the community to teach basic literacy and numeracy skills to children lagging behind in government schools. The program was to be very effective: it increased average test scores of all children in treatment schools by 0.14 standard deviations in the first year, and 0.28 in the second year. A computer-assisted learning program provided each child to play educational games that reinforced mathematics skills. The program was also very effective, increasing math scores by 0.35 standard deviations the first year, and 0.47 the second year. The children who attended the remedial classes, remedial education benefited their classmates, who did not attend the remedial classes did not show post gains.

Barot (2005) developed a CAI in Sanskrit for Std. VIII students and to study its effectiveness in terms of mean achievement of students in Sanskrit and to study the reactions of the standard VIII students regarding the effectiveness of the developed CAI package. 86 samples were taken for the study. The developed CAI in Sanskrit was found effective in teaching Sanskrit to VIII std. Students. The reactions of the students towards the developed CAI in Sanskrit were found positive.

Rakesh Pardeshi (2005) developed the CAI in learning Trigonometry by English medium students of standard IX and find out its relative effectiveness in three settings such as mono, diad and triad. No significant difference has been found in the mean achievement scores of the experimental group in mono, diad, triad and control groups, respectively in the pre test. Significant difference has been found in the mean achievement scores of the post test in the experimental group in triad over control group. The students were found to have positive reactions towards the developed CAI.

Vadiraj et al (2010) evaluated the effectiveness of traditional lecture as compared to CAL process on study model analysis for undergraduate dental students. The study comprised of forty students
randomly allocated to two groups stratified on pre-test GPA scores. One group received traditional lecture and the other received the CAL module. The effectiveness was assessed immediately and ninety days after the teaching process by paired 't' test. The control Group (N=16) mean scores in retention test was 4.5 ± 0.88, where as the experimental group with CAI module (N=16) was 4.85 ± 0.55. After retention period it was observed that the CAL group retained the knowledge significantly better than the traditional lecture group. It was concluded that CAL can be an effective teaching aid compared to other teaching methods for clinical skills and attitudes.

Barad (2010) developed a Computer Assisted Instruction Programme in science subject for IX standard students to assess the effectiveness of CAI for Science teaching in urban area (Bardoli) Surat in Gujarat. The experimental group (N=60) and traditional group (N=60) are equaled on pretest scores. Students learn same content of 'Motion' 'force' and 'acceleration' over 30 periods. The result shows that in ANOVA the F value is 447.709 and the science teaching through CAI programme was more effective for high IQ students than low IQ students. There was no significant difference found between boys and girls (0.942).

2.2.3. STUDIES RELATED TO MULTIMEDIA

Few studies conducted on multimedia by various researchers and reported that the package enhances effective learning over conventional teaching.

Vardhini (1983) and Menon (1984) tested a multimedia package with instructional strategy for teaching science at secondary level. Multimedia strategy was found feasible when seen in terms of student's attitude and achievement with suitable cost and time components.
Kumar (1998) find out the relative effectiveness of three methods of instruction called exposition method, programmed learning method and multimedia method in science education. Multimedia method was more effective than either the programmed learning or the expository method. The programmed learning method was more effective than expository method.

Ramaiah (1998) described multimedia and its applications in libraries for reference service and instructional purpose for their users to provide quick reference. The result of the survey clears that multimedia facilities in libraries can satisfying different information needs such as reference, enrichment, entertainment, leisure, and can help meeting various types of information such as scholarly, scientific, vocational, artistic, recreational.

Kartar Singh (2000) prepared simulation and play method for teaching Economics at +2 level and to find out the effectiveness of simulation and play method as a teaching method over conventional teaching. This survey was undertaken with a view of understanding the new Educational Technology scheme and also to know which educational audio and video programmes are listened to or viewed. Samples are taken from semi urban and rural hilly areas. The results found that the mean achievement scores of the experimental group were significantly higher than that of the control group.

Instructional Strategies in General Science and Social Studies of X Standard was prepared by Muchal (2001) and to study the relative effectiveness of different instructional strategies, printed text, printed text and video lesson and discussion in terms of achievement and gender. 60 General Science and 60 Social Studies students are taken as the samples for the study. The result shows that the video lesson has been found more effective than printed lesson. Post- video instructional discussion has been found more effective than video lesson. Video lesson and Post video discussion have been found more effective than
only video lesson, and video lesson has been found more effective than printed lesson. The achievement through distance education has been found gender independent whereas in non formal education it has been found gender dependent.

Premila (2001) reported the effect of learning mathematics among high school students by developing a CD package. The study reveals the effect of conventional teaching over computer multimedia teaching. Before utilizing the package among the high school students, for their higher education, 33.85% of sample preferred mathematics as a subject and 40.63% of sample preferred science. After the mathematics package was implemented for high school students 53.85% preferred mathematics and only 24.62% preferred science subject. 53.85% of students preferred mathematics due to the impact of multimedia and it created interest among the students in selecting their subjects. There is also a significant change in their retention of learning (‘t’ value 3.76) and attitudes towards mathematics (‘t’ value 3.70), through CAI and self learning method. Both male and female performed better in utilizing the package.

Nirmala Devi (2002) developed a computer multimedia program for teaching science to IX standard students and studied its effectiveness over conventional method and reported that learning through multimedia showed better performance than learning through traditional method of teaching. In pre test the size of the sample in experimental group (N=100) and control group (N=96). In pre test the ‘t’ value is (0.85), and in post test the ‘t’ value is (7.3). The ‘t’ value shows that there is a significant difference between the experimental and control group. Further she also studied the high mean gain scores of the low achievers of the experimental group than that of high achievers. This confirms that the instructional methods help the slow learners to achieve better.
Beena (2004) developed a multimedia package constituted of transparencies, pie graph, charts, diagrams, pictures, video tape, audio tape, and slide set and to find out the efficacy of teaching through the traditional and multimedia approach in the Subject of Home Science. 98 samples are taken for the study. The mean achievement of the experimental group was found significantly higher than that of the control group. The students were found to have favourable opinions towards the multimedia approach. The study has found the relative efficacy of teaching through the traditional method and the multimedia approach in the subject of Home Science, particularly, Proteins.

Rajkumar (2005) studied the effectiveness of intervention strategies on developing competence in teaching science among DTE (Diploma in Teacher Education) students. The availability of computers has made it possible for the school system to exploit its potential as an aid to teaching. The results of the study found to be effective in the field of technology. With the help of suitably prepared computer software, teachers can teach and students can learn the different concepts of different subjects more effectively.

Three multimedia packages were developed by Jayaraman (2006) to the students of class V, VIII and XI and to find out the relative effectiveness of the CBMMLP (Computer Based Multimedia Learning Packages) in facilitating the learning of various concepts in hard topics. The experimental groups are constituted of 104 students (V-31, VIII-37 & XI-36), whereas, control groups are constituted of 92 students (V-31, VIII-31 & XI-30) were taken as samples. The results show that the performance of the students who have learnt through CBMMLP is higher than the performance of the students who have not learnt through CBMMLP. The analysis of the effect size reveals that it varies between Class V, Class VIII, and Class XI, which is, 4.20, 2.83 and 4.72 respectively. These effects sizes are considered as large and educationally significant. Higher age group students have been found to
have more positive attitude towards CBMMLP than the lower age group students.

**Patil (2006)** developed a Multimedia Instructional System on Computer Education for B.Ed. Pupil Teachers and to find out the effectiveness of multimedia instructional system with the conventional system of instruction. Final implementation of the Multimedia Instructional System was implemented to a sample of 64 pupil-teachers (32(20+12), 32(20+12). The result show that there is a significant difference was found between the performance of the pupil teachers of control group and experimental group on the post-test.

**Sangeetha Ramasamy (2007)** developed a multimedia package for the teaching of history to secondary level students and studied its effectiveness over conventional method. The study was conducted for four groups in two phases. Among the total 175 samples boys (N=90), Girls (N=85), the ‘t’ value for pre and post of the experimental group was 20.55 and the highest gain score was obtained by the fourth group so called multimedia group. So in this study the ‘t’ value explains that, multimedia package is most effective in learning history since it integrates the elements like text, still and motion pictures, animation and audio when it is compared with conventional teaching. Further the experiment concluded that multimedia has tremendous impact upon enhancing the achievement level of the students in history at the secondary level.

**Manoj Kiledar (2008)** explained a model for ‘Total Quality’ of an open and distance education system has used to measure the impact of the “Web Technology” on the ‘Total Quality’ of the learning experience in ‘Open and Distance Education System’. Samples are, during July–December 2004, total 2532 students were enrolled for the first batch, (2305 male and 227 female) But, among the enrolled students 2156 (85.15%) was just from 4 regions, that is, Mumbai,
Nagpur, Nashik and Pune the industrialized regions of the Maharashtra state. The result of effectiveness in One Way ANOVA (Effectiveness) was only 9.71. However, in a country like India it is not possible to rely totally on the web technology, both traditional classroom techniques and virtual classroom must function in collaboration with each other.

Edward and Sivakumar (2008) revealed the interactive nature of multimedia and provide immediate and comprehensive feedback to students at higher secondary level. The interactive multimedia enhances effective self learning among students due to the facilities like, the system presents, stores, retrieves and transmits audio, video, graphics, and textual information. A comparative value of mean achievement scores of pre test Mean and SD is 19.53 and 5.05 (N=15) for the control group and experimental group the mean is 18.73 and SD is 4.23. So the mean difference of the pre test is 0.80. In the post test the calculated Mann Whitney U-test is the region of acceptance that lies between 70.25 and 174. Likewise the mean scores of the post tests of the experimental group are higher than that of the control group indicating significant difference. The interactive multimedia CD based learning courseware enhances physics learning over the conventional method of instruction.

2.3. STUDIES ABROAD

Various studies are conducted abroad regarding PLM, CAI and Multimedia packages in relation to learning all the subjects and their inter disciplinary nature also. There are ten studies of PLM, twenty nine studies on CAI and thirty one studies regarding multimedia are given.

2.3.1. STUDIES RELATED TO PROGRAMMED LEARNING METHOD

More number of researchers studied about PLM and all the studies based on various subjects found to be effective.

Brooks (1961) explored the relation of latency of answers to errors in programmed materials. The data supported the view that longer
latencies tend to go with errors. Latency was found to be more sensitive than, error rate as a measure of difficulty.

**Hickey and Anwyll (1961)** looked into the effectiveness of programmed learning in industry. They used the programme on "Procedure of Package Billing" and found a 34 per cent reduction in the average number of working hours needed to attain criterion level of performance.

**Hickey and Laidlaw (1962)** tried out programmed material on "Retail Sales and Ship's Store Management" with U.S. Navy Supply Officers. The student who used the adjunct programmed saved 56 per cent of the usual homework time in reaching the performance criterion. The instructor's lecture hours were reduced to 54 per cent. The attitude to the programme was generally favourable.

**Moore and Smith (1962)** studied the effectiveness of programmed instruction by machine, programmed text book, plus a weekly seminar vs. text book plus weekly seminar. No significant differences in achievement related to teaching machine, programmed text book or conventional text book were found. They also studied the effectiveness of the teaching machine, programmed text book, and conventional text book without supplementary class work. The machine group, scored significantly higher than the conventional text group both on immediate and delayed post-tests.

**Beane (1962)** found that, time-wise, the branching programme was more efficient than the linear programme. The student's attitudes were more favourable to the linear programme.

**Alter and Millicent (1962)** tested the subjects twice: immediately and again after a retention interval of 2 to 30 weeks. The more intelligent students performed better on the re-test than the less intelligent students.
Angell and Lumsdaine (1962) found that when students were tested immediately after finishing the programme, scores for the vanishing and the non-vanishing versions of the same programme did not differ significantly. However, scores on a delayed retention test were significantly higher for the vanishing than for the non-vanishing treatment.

Goldbeck et al (1962) integrated programmed learning with conventional classroom teaching. They found that a few minutes a day of programmed learning integrated with conventional classroom teaching could raise student performance significantly higher than could be achieved by conventional classroom teaching alone. Furthermore, student attitudes were favourable to programmes used this way and tended to become more favourable with longer acquaintance.

Eigen (1963) surveyed the student reaction to Programmed Instruction. In general, students using the programmed text had a more favourable attitude toward Programmed Instruction than those who used the teaching machine. Students' total attitude toward accommodated teaching, however, appeared to have no relationship with how much they had learned by the method. The results concluded that it was difficult, if not 'impossible, to conceive of a typical reaction to controversial statements about Programmed Instruction after a student's first exposure. Attitudes differ vastly from student to student.

2.3.2. STUDIES RELATED TO COMPUTER ASSISTED INSTRUCTION

Various researchers developed CAI packages and conducted studies on the effectiveness of CAI over traditional method of teaching. The results of the studies show that the CAI package found to be more useful in different fields of teaching and learning.

The developed CAIs were compared with the traditional Method in teaching different subjects in terms of achievement has been the

Pien and Chan (1995) investigated two important issues: first, what the teachers perceived to be the major advantages and disadvantages of implementing computer-aided instruction (CAI). Second, what they perceived to be the major facilitators and inhibitors of CAI implementation. The study collected responses from 117 secondary school teachers. Results showed that immediate feedback to students and provision of alternative teaching techniques are the major advantages of CAI. The results further highlighted that support from the Ministry of Education, availability of teacher’s time and resources, as well as provision of administrative support facilitate CAI implementation.

Nancy et al (1999) developed a Computer-Assisted Personalized Approach (CAPA), a networked teaching and learning tool that generates in large-enrollment introductory plant physiology course. They used more than 170 problems on 17 topics in introductory plant physiology class. Among the CAPA assignments in Botany the students’ responses are Fifty-five of 56 students (98%) completed the survey in the Fall 1996 semester, and 69 of 84 students (72%) completed the survey in the Spring 1997 semester. The majority of plant physiology students responding (80% and 69% in Fall and Spring, respectively. Ninety eight percent (Fall 1996) and 91% (Spring 1997) of students responding considered the multiple tries feature to be helpful and solve problems. Three mandatory CAPA assignments were given related to
Mendelian genetics and physiological genetics. The mean score was 28 out of 30 points (94%, N=60). A complete set of 13 mandatory CAPA assignments was implemented and the mean score was 137 out of 172 points (80%, N=88). This shows that CAPA being an effective and efficient substitute for hand-graded homework.

Jimoyiannis and Komis (2001) studied to determine the role of computer simulations in the development of functional understanding of the concepts of velocity and acceleration in projectile motions for two groups (control and experimental) of 15-16 years old students. Both groups received traditional classroom instruction on these topics; the experimental group used computer simulations also. The results of the study show that students working with simulations exhibited significantly higher scores in the research tasks. The researchers claim that computer simulations could be used complementary or alternative to other instructional tolls in order to facilitate students' understanding of velocity and acceleration.

Christmann et al (2003) compared the academic achievement of elementary students who received either traditional instruction or traditional instruction supplemented with CAL. From the 68 effect sizes, an overall mean effect size of 0.342 was calculated, and the result indicates that on average, students receiving traditional instruction supplemented with CAL attained higher academic achievement than did 63.31% of those receiving only traditional instruction.

Sutherland and Rosamund (2004) explored the relationship between ICT and learning in English schools. It draws on the preliminary results of the Interactive Education Project, which is concerned with learning within the subject areas of English, history, geography, mathematics, music, modern foreign languages and science. It is predicated on the view that ICT alone does not enhance learning. They argue that much of the hype around e-learning is fundamentally
flamed in that it fails to take into account the social, cultural and historical aspects of learning.

**Suwanna Ruttanathammatee (2004)** prepared CAI packages and to find out the relative "Effectiveness of Computer Assisted Instruction for Primary School Students. 150 samples are taken for the study. The study has resulted in the development of CAI Programmes on selected five units of Thai language have been found effective at both the levels (Pratom-3 and Pratom-6). The CAI Packages developed by the investigator on Thai language and on English language were found significantly and equally effective with all the eight replication groups. The CAI Packages developed by the investigator on Thai language and on English language received favourable opinions both by the teachers and students.

**Ngu and Rethinasamy (2006)** evaluated the effectiveness of a CALL lesson (Computer Assisted Language Learning) when compared with a conventional lesson in assisting students to learn English prepositions in a Malaysian school. The study indicates that students who received conventional teaching performed better than those who went through the CALL lesson. It was observed that there was greater improvement from a pre-test to post test for the conventional group rather than the CALL group. It also shows that the conventional group with the latter exerting more mental effort and achieving a lower transfer performance than the former. The researchers suggest that to facilitate the transfer of learning, the design of an educational software package needs to minimize the mental.

**Malmskold (2007)** conducted two studies to compare assembly performance and learning rate between computers based training and traditional training of skilled assembly operators. The studies were performed with pre-series production parts from a car cockpit and they were integrated as part of the overall training activities during a new
and doctoral degree and 124 articles. As a result for the study, the effect size of computer-assisted instruction method for academic achievement calculated 1.048. It proves that effectiveness of computer-assisted instruction have been growing recently in Turkey.

**Slavin et al (2008)** observed the achievement outcomes of four types of approaches to improving the reading of middle and high school students: (1) reading curricula (2) mixed-method models (methods that combine large-and small-group instruction with computer activities) (3) computer-assisted instruction and (4) instructional-process programs (methods that focus on providing teachers with extensive professional development to implement specific instructional methods). A study duration of at least 12 weeks, and valid achievement measures that were independent of the experimental treatments. The result concludes that programs designed to change daily teaching practices have substantially greater research support than those focused on curriculum or technology alone. Positive achievement effects were found for instructional-process programs, especially for those involving cooperative learning, and for mixed-method programs. The effective approaches provided extensive professional development and significantly affected teaching practices.

**Abraham (2008)** explained that Language learners have unprecedented opportunities for developing second Language literacy skills and intercultural understanding by reading authentic texts on the Internet and in multimedia computer-assisted Language learning environments. Computer-mediated glosses had an overall medium effect on second language reading comprehension and a large effect on incidental vocabulary learning. Mean effect sizes varied from medium to large depending upon the level of instruction text type, and assessment tasks.

**Olusi (2008)** explained the effect of computer aided Instruction and traditional method of instruction on the junior secondary School
students’ achievement in mathematics. The sample for the study consists of 270 randomly selected students from three junior secondary schools in Edo state. The instruments constructed by the researcher, validated and reliability coefficient of the instruments are 0.75, 0.79 for Test of Understanding of Mathematics using Computer (TUMUC) Test of Understanding of Mathematics using the Traditional Instruction (TUMTI) respectively. The findings of the study were that CAI significantly influenced student’s achievements in mathematics than the programmed instruction than the traditional instructional method.

Chuang Tsung-Yen et al (2009) investigated whether computer-based video games improve children's cognitive learning or not. In comparison to traditional computer-assisted instruction (CAI), this study explored the impact of the varied types of instructional delivery strategies on children's learning achievement. One hundred and eight third-graders from a middle and high socio-economic standard school district in Taiwan participated in the study. Results indicated that computer-based video game playing not only improves participants’ fact/recall processes (F = 5.288, p less than 0.05), but also promotes problem-solving skills by recognizing multiple solutions for problems (F = 5.656, p less than 0.05).

Zucker et al (2009) explained electronic books (e-books) are a prevalent method for integrating technology in preschool and elementary classrooms. This study assesses the efficacy of e-books with a comprehensive review method, including a systematic literature search, comparison of outcomes with effect sizes, and discussion of individual studies. Results indicate that the effects of e-books on comprehension-related outcomes were small to medium in size. The study also suggests that some interactive e-book features support
comprehension whereas other incongruent features may hinder comprehension.

Cebeci et al (2009) explored the relationship between the student performance and instructional design. The research was conducted at the e-Learning School at a university in Turkey. The experts scored 25 university courses. Multiple-regression and supervised artificial neural network (ANN) models were used to examine the relationship between student grade point averages and the scores on the five design factors. The results indicated that there is no statistical difference between the two models where as both models identified as the most influential factor.

2.3.3. STUDIES RELATED TO MULTIMEDIA

Various studies regarding multimedia are conducted and results show that the effectiveness of the package over traditional teaching. Apart from school level, many studies are conducted on college level and other fields also.

Huppert and Lazarowitz (1991) developed a CAI package with multimedia features in biological science subject and to implement to pre service teachers to overcome their reluctance to use computers and investigate student-teacher attitudes towards the use of a CAI approach with text, graphics and animations. The students attitudes were assessed by pre and post test mean scores of the sample study (N=31). Based on the results of the study, the integration of CAI can help teachers in their teaching strategies (‘t’ value 2.09), the understanding of science (‘t’ value 2.07), creates positive classroom learning environment (‘t’ value 1.87) and improves students’ self esteem (‘t’ value 2.63). The study reveals that the strategy using CAI approach with all the features encourages teachers in the use of computers in the science classroom.

Eisenback (1993) revealed that the availability of interactive multimedia authoring software programs promises to revolutionize the
The findings suggest the CAI module was effective only for few groups in improving the integrated science process skills of students.

Kate Hand (1999) explained the courses in online naturally involve a lot of participants can read and respond to messages from the instructor and other classmates. Emotions and textual clues only go so far to demonstrate a personality behind the words. Although online learning offers a more direct mode of communication between the learner and the instructor than in many in class situations, many students and educators feel that a deeper interaction is needed to feel part of the group dynamic.

Sgouropoulou et al (2000) proved that asynchronous multimedia conferencing seems both suitable and sufficient for supporting such a process. Learning can be reconceptualised as a process of increasing mental, physical and organisational involvement in a community of practice: a process in which learners come to understand, adopt and eventually improve the actual working practices contextualised, vocationally relevant knowledge makes the sharing of information about actual working practices. Asynchronous text-based communication has long been established as having value in supporting the collaborative sharing of knowledge for learners or practitioners.

Sneddon et al (2001) analysed academic performance on a level 1 plant science multimedia module between 1994-1999. When A-level point score remained stable, and the curriculum content was unchanged. Teaching delivery altered radically in that content delivered via lectures was replaced with multimedia material and workshops (n = 20). Assessment altered from an exam (50% of module mark) to four phase tests (12.5% of module mark each). The percentage of students passing the module significantly improved between 1994 and 1999. The Mean course mark of the year 1994 is (44.4 ± 17.50), 1995 (49.3 ± 15.70),
1996 (52.0 ± 18.67), 1997 (55.5 ± 15.27), 1998 (52.0 ± 13.67) and 1999 (52.3 ± 17.53). The result shows that the mean coursework mark significantly improved. The improved performance in actively engaging students in learning at their own pace and from each other, as well as enforced use of private study time to prepare for workshops and phase tests were felt to be the principle benefits of using multimedia/workshops which were largely responsible for improved academic performance.

Jesshope (2001) developed audiograph multimedia CD tool to find out its effectiveness among online education over conventional mode of education. The experiment was undertaken over a three years period for the three year degree course. In the control year 1998 (N=31), face-to-face lectures based on PowerPoint presentations. During the experimental years, in 1999 (N=33) and again in 2000 (N=23), the Audiograph, web-based multimedia material has given. There is a substantial improvement of the average marks in the class is 4.0/8 in 1998, 4.7/8 in 1999 and 5.5/8 in 2000. Moreover, the most surprising result was that in both in 1999 and 2000, with the exception of one student who did not complete the course for personal reasons in 1999, all students received a C+ grade or better, whereas in 1998 the failure rate was about 12%. The results of this experiment have shown that the conventional lectures were replaced by on-line Audiograph multimedia material and the time saved was used for more interactive tutorials. Further the study encourages the educators to adopt new technology like Audiograph multimedia material and to explore new approaches to education.

Neo and Neo (2001) explained to access the students’ skills in framing and solving problems using multimedia technologies. The students develop and design a CD-Rom of their own topic and present it within the fourteen week semester. Among the respondents (N=46),
(91% of the students found the project challenging, 89% felt that the project allowed them to have better understanding of their topic and 78% were able to learn from their teammates. From the results of the study, majority of the students were motivated, challenging and inspiring in visually representing the content material. Multimedia oriented projects can be used alternatively as an innovative and effective tool in a problem based learning environment.

Albalooshi and Alkhalifa (2002) prepared a multimedia module and a verbal module to assess the effectiveness, when it comes to conceptual versus procedural knowledge. The sample (N=46), is divided into three experimental groups. This system is tested and results indicate that combining the two media leads to a cognitive interaction that promotes student learning with no less than 40% from their post classical-classroom session levels. Another point of view is to examine the scores by using the total average, which is 10.639, therefore approximating the border-line becomes 10.5 and the rest of the scores will be divided around this line. It is to be noticed that the scores of the third group (SD is 2.759) were not so high, but most of them were over the average and comparing with the second group (SD is 5.305), shows that the results are close even if the third group took only the module option while group two had both lecture and module learning. It also underlines how much the second group improved their test results after taking the CBI and in the same time showing that the first group (SD is 2.880) had not improved much only with the lecture learning. The combination of both media allowed students with either of the above strength to learn from the same system. This implies that this group learns more readily from a graphical or animated representation.

Brien and Sharratt (2002) investigated the ways in which the expectations and beliefs of academic staff about computer-based
learning impact the design of learning media and their integration into the student learning experience. Differences in approaches to multimedia were clearly expressed when the interviewees were asked to indicate what their perceived outcomes for their project were and how they expected to measure success. The process-focused staff listed strategic issues of IT infrastructure, changes in teaching and learning and the empowerment of the teaching staff and students as their perceived outcomes. A greater understanding of the requirements of multimedia production, both from the teaching and the technical perspectives is needed to ensure that team members work effectively together.

Gold et al (2002) developed a multimedia component for a print-based economics statistics course (ES project) for a recent USP distance education project to introduce technology into the development and delivery phases of an existing course. The ES project succeeded despite the realities of the USP environment due to two key decisions that can be instructive for others: separating the technologies of development and delivery, and using a simple, familiar development environment instead of a specialized one. At the end of the six-month project, the ES team produced nine PowerPoint multimedia programs that were edited together with small segments of live video to create over two hours of professional-quality videotape for delivery to students. These received an enthusiastic response from the target students. Major findings of the study are that the computer-based presentation was very attractive, flexibility, more feasible and interactive enhancements rather than replicating work already done in delivering computer based materials.

Fanny Klett (2002) explains the flexible access to various media challenge on pictures, signs and media, with interactivity of a multimedia feature and the traditional experience in shaping learning environments for online education. The hypermedia-based learning
environments should be viewed. In the Ed-Media content library contains 2D and 3D models, 2D and 3D animations, Virtual Reality Worlds and simulations, which effectively support the imaginative process, and the spatial knowledge acquisition, allowing the learner's immersion in a hidden world. Considering prior knowledge (external consistency) and experience (experience consistency), the way of placing the various media elements (text, sound, static and dynamic illustrations) and the interaction elements, the visual communication elements for dealing with the application (internal consistency), presents an essential part of the navigation through the information space and the orientation in the learning environment. The study reveals that the interactivity based hypermedia to improve the learning efficiency of different learners.

Jensen et al (2002) assessed the effectiveness of multimedia instructional modules used in a basic engineering class at the United States Air Force Academy through the use of visualization. The 1998 version of the study attempted to correlate too many variables resulting predominately in data which was statistically insignificant. In 1999, the assessment results from this study produced two types of results due to the professor's negative perception of the modules. In 2000 the visual content was reused, but the link between this content and the conceptual questions on the examination was emphasized. The professor who had a negative perception of the modules is not allowed to participate in the study. In 2000 assessment shows that the visual multimedia modules did enhance understanding when compared to a traditional lecture format.

Panagiotakopoulas and Ioannids (2002) try to find out the effectiveness of computers and multimedia software in assessing the understanding of basic time concepts by children in contrast to the use of traditional-conventional methods of presentation. For this study, special multimedia software was developed, using a high level language,
which simulated standard time perception tests. The study asserts that the presentation method employing the use of multimedia is preferable when the environment through which the time concept is examined is not static but involves movement or changes. Results of the study indicated superiority in children’s judgements when multimedia software was used. The authors claimed that this superiority was most pronounced in experiments that involved motion or action.

Song and Lee (2002) described the use of the Virtual Reality Modeling Language (VRML) to visualize 3-D objects for middle school geometry classes in a networked environment. VRML is the file format standard for 3-D multimedia and shared virtual worlds on the Internet. To evaluate the effectiveness of a VRML-based geometry class, two groups of classes were created: one using networked VRML materials, and the other taught in the conventional way. Results of the study show that the application of VRML-based 3-D objects have a positive affect on students’ learning for geometric topics. VRML-based geometry classes provide a virtual reality of figures and objects that cannot easily be described verbally. Any geometry figure can be easily modeled into VRML drawings making it a good visual aid toll of the geometry class.

Asan (2003) described an interactive and self-paced multimedia tutorial programme that provides pre-service teachers with a complete range of school system and teaching strategies. It evaluates the impact of the programme on pre-service teachers’ learning experiences. Two methods of information delivery were investigated: traditional learning and multimedia. The results show that using the multimedia tutorial leads to a positive difference in the school experience course over participants in traditional lecturing and pre-service teachers responded positively to a multimedia approach. This study concludes that using multimedia in teacher education enriches pre-service teachers’ learning
and provides them with an opportunity to view and critique various teaching methods and classroom activities collectively.

**Hewitt et al (2003)** explored the growing interest in the use of multimedia cases for the purposes of pre service teacher preparation. It is proposed that it may be advantageous to personalize case methods by focusing pre service teachers more directly on their own pedagogical decision-making processes. This study describes an innovative study in which teacher candidates' immediate reactions to videotaped teaching scenarios were recorded and made the subject of personal and group analyses. Results from the research suggest that this approach has the potential to help candidates develop deeper insights into their own classroom practice.

**Hasenekoglu and Timucin (2004)** was developed a Computer Assisted Biology Instruction (CABI) material with multimedia presenting animations to visualize the basic concepts of the "Nucleic Acids and Protein Synthesis" unit as a case for high school biology curriculum (9th and 11th grade) and can be used to support traditional instruction. The results shows that most of the teachers think (94% agree, 6% abstain) that material would increase student interest, let student construct their own knowledge, provide suitable pre-organizing knowledge and self assessment opportunities. 81% of the teachers think that learning gains are conveniently embedded in the presentation, whereas 19% of them are abstainers. 75% of them think that material is suitable for group activities (12% abstainer, 12% disagree). The teachers evaluate the material as it gives opportunity to use biology knowledge and logical conclusions (81% agree, 19% abstain). Considering the whole survey the teachers evaluated material 90% positively as a boost attention in classroom setting (8% abstain, 2% disagree).

**Russell et al (2004)** prepared a CD-ROM containing two practical modules and three theoretical modules, for tertiary level
students on the topic Photosynthesis in biology education. Interactive multimedia package in photosynthesis with graphic design and animation for photosynthetic electron transport is suitable for a lecture presentation or for self-paced learning by students. Experimental simulations of photosynthetic gas exchange and chlorophyll fluorescence also can be used as packages to enrich a laboratory demonstration / experiment. Results of the study improves learning outcomes through the documented advantages of computer-based learning, this set of modules provides students with access to the latest experimental techniques and theory, improving their understanding, updating their skills and switching them on to the amazing process that brings energy into our biosphere.

Wegeriff (2004) described the dual nature of computers, as machines (objects) and (subjects), allows them to play a potentially distinctive and valuable role within educational conversations. This role is to resource and, at the same time, to frame and direct, learning conversations amongst small groups of children in English schools. One hundred and nineteen children aged between nine and ten participated in the study. The evaluation included video-recording, transcript analysis and a matching control group who covered the same areas of the curriculum without the intervention. The evidence presented in this study shows that a combination of pedagogy and software design can exploit the ambivalent nature of computers to make them serve as both interactive agents, or tutors, and as passive ‘learning environments’ within the one educational exchange.

Gentry et al (2005) prepared a multimedia CD-ROM to generate stories for children who are deaf and to assess the relative effectiveness of sign and pictures in the transfer of reading by four methods. A multimedia in this CD-ROM is with sound, still/animated pictures, text, and computer data along with drill and practice, tutorial, simulation and
problem solving skills. Among the participants (N=25), the results of F test in ANOVA is 22.27, and using Tukey post hoc analysis In the present study results shows that (Mean treatment scores 16.32) 'print plus pictures” was the most efficacious of all treatments.

**Moreno et al (2005)** investigated whether guidance and reflection would facilitate science learning in an interactive multimedia game. College students learned how to design plants to survive in different weather conditions. In experiment one, they learned with an agent that either guided them with corrective and explanatory feedback or corrective feedback alone. Guidance in the form of explanatory feedback produced higher transfer scores, fewer incorrect answers, and greater reduction of misconceptions during problem solving. Reflection in the form of having students give explanations for their answers did not affect learning. Results support the appropriate use of guidance and reflection for interactive multimedia games.

**Susskind (2005)** examined, the effects of non-interactive computer assisted instruction on students' performance, self-efficacy, motivation and attitudes. Half the lectures presented to two Introductions to Psychology classes were taught in a traditional lecture format and half were accompanied by PowerPoint multimedia. The results imply that accompanying lectures with PowerPoint presentations does not significantly affect students' achievement. Both students' responses to the attitude questionnaire and their open-ended comments reflected greater positive attitudes and self-efficacy beliefs when PowerPoint accompanied lectures. The author claims that non-interactive computer assisted instruction yields more subjective effects than objective ones.

**Jereb et al (2006)** described the designing of multimedia instruction and its advantages in higher education. Students involved in the survey found the lessons understandable and systematic, very
interesting and very carefully prepared. They felt that these lessons would enable them further independent study. They were enthusiastic about the self-assessment tests, which helped them to find out whether the information learned was right or wrong. The study showed that students were satisfied with this kind of studying and were looking forward to using computer-based multimedia learning material for other subjects as well. The authors claim that the use of multimedia instruction adds variety to the study and increases the quality of an individual's work and the motivation of learners.

Killi (2006) presented a participatory multimedia learning model support an active learning process and creative participation. The study also elaborates on the results of an empirical study examining the effectiveness of student generated illustration elementary students (N=187) learned about the human immune system by interacting with multimedia learning materials. Students performed better on a retention test when they generated their own illustration by drawing and when explanations were presented as animations, compared to students who received only textual material or generated illustrations from images offered.

Finkelstein et al (2006) demonstrated computer simulations from the Physics Education Technology (PhET) project and their utility in a broad range of environments typical of instruction in undergraduate physics. 50 research based simulations of introductory physics are designed to be highly interactive, engaging, and provide animated feedback to the user and can be run from the internet or downloaded for offline use. Based on the samples (N=100), the control group weighted average is 41% and the treatment group treated with the simulations, the weighted average is 63%. From the results it is understood that there is a significant difference between the groups using new high tech tools achieved better.
Matsuda and Shindo (2006) described the effectiveness of Cyber Assistant Professor (CAP) and Cyber Theatre (CT). CAP has been designed for a self-learning system, which enables interactive communication between virtual teacher and learner. CT has been designed for a 3D-CG (three Dimensional Computer Graphics) story maker. The production of interactive 3D-CG animation teaching materials in CAP is not difficult and claims that this technology would make students aware that a computer is not only a tool for browsing information, but also a tool for creating information.

Yenilmez et al (2006) investigated the effectiveness of combining conceptual change text and discussion web strategies on students' understanding of photosynthesis and respiration in plants. Students' conceptual understanding of photosynthesis and respiration in plants was measured using the two-tier diagnostic test to a total of 233 eighth-grade students in six intact classes of the same school located in an urban area. The experimental group was a class of 116 students received multimedia web and conceptual change text instruction. A class of 117 students comprised the control group received a traditional instruction. The conceptual change instruction, which explicitly dealt with students' misconceptions, produced significantly greater achievement in understanding of photosynthesis and respiration in plant concepts.

Zheng and Zhou (2006) investigated the impact of recency effect on multiple rule-based problems solving in an interactive multimedia environment. An interaction between multimedia group and spatial ability (Wilks' Lambda = 6.480; p = 0.004). Overall, high and low spatial ability subjects in the synchronized group outperformed their counterparts in the unsynchronized group F(1, 44) =10.091, p < .05). With regard to test scores the synchronized group (Mean = 5.43) scored higher on problem-solving test than the unsynchronized group (Mean =
4.41). The analysis of efficiency scores revealed that the synchronized interactive multimedia could facilitate recalling and maintaining on-demand information in working memory - a recency effect, thus enabled learners to solve problems more efficiently and replace the traditional paper and pencil approach.

**Ergazaki et al (2007)** studied three dyads of high school students (age 14 years) each collaborating on a plant growth modeling task in the computer-supported educational environment "ModelsCreator". The analysis is carried out with a two-level analytic tool that has been derived within the theoretical framework of "activity theory". Our results show that a wide range of modeling "operations" is activated in the context of the three major modeling "actions" of "analysis", "synthesis" and "testing-interpreting", which take place in the light of the facilitator-driven "action" of cognitive and technical support actions are combined into "modeling units".

**Gong et al (2007)** has been used Multimedia English teaching method among colleges in China to set up a harmonious and high-effective teaching atmosphere in the English class to make students take part in the practice. The study focused on multimedia teaching method and can fulfill the target of college English teaching by utilizing modern education technology. Because of the powerful functions of the computer, multimedia teaching method has modularisation, intelligence and interaction, students can talk with the virtual characters set by the computer. Students can correct their own mistakes, interest of self-study in English will be strengthened, and their ability of speaking and listening to English will be also heightened.
2.4. OVER VIEW OF THE RELATED STUDIES

The relative effectiveness of programmed learning material over traditional method in teaching various subjects is the subject of the study for many researchers like Goldbeck et al (1962), Moore and Smith (1962), Alter and Millicent (1962), Eigen (1963), Vardhini (1983), Gautham (1986), Shihabudheen (1988), Jyoti Tare (2001), Sharma Sumita (2005) and Jijish Eliah (2009), conducted studies to find out the achievement level, while using programmed learning material.


The favourable attitudes towards the preparation and evaluation of Programmed Learning Material on various subjects have been studied by many researchers like Beane (1962), Kulkarni and Mullick (1968) and Shah (1972). The effectiveness of programmed learning in industries were found effective have been studied by Sarkar (1969) and Hickey and Anwyll (1961). Hickey and Laidlaw (1962) studied the effectiveness of programmed learning and reducing the instructor’s lecture hours in Navy.


Kumar (1998) find out the relative effectiveness of interactive multimedia package over expository and programmed learning method and increases the retention rate is the subject of the study.

The effectiveness of interactive multimedia tutorial package for pre service teachers is the subject of the study for many researchers like Huppert and Lazarowitz (1991), Asan (2003) and Hewitt et al (2003). Nirmala Devi (2002) conducted a research study on multimedia packages and to find out the effectiveness in relation to improve their academic performance, and the achievement of slow learners whereas Premila (2001) conducted the research study on the effectiveness of multimedia packages along with their retention rate and attitude. Many research studies conducted on multimedia packages and to find out the effectiveness in relation to improve their academic performance in other fields like engineering, games by Jensen et al (2002) and Moreno et al (2005).

2.5. REVIEW OF INFERENCEs

From the above review of literature and studies in the field of technology based learning, the effective learning strategies are to be evolved. In twentieth century PLM was very popular and CAI occupies the position on education and various fields. When multimedia packages are prepared using the CAI and automatically it replaces the CAI, and it plays a major role in education. In abroad multimedia packages are modified into virtual laboratories and so on.