CHAPTER II
REVIEW OF RELATED LITERATURE

This chapter deals with the review of related studies. It is a summary of prior researches, books, abstracts, theses and other documents available in various libraries, study centres and on websites relevant to present research. A literature review involved the information useful for identifying, analyzing and summarizing the data of present research.

According to Best\textsuperscript{23}, “A summary of previous research provides evidence that the researcher is familiar with what is already known and what is still unknown and untested. This helps to eliminate duplication of what has been done and provides useful hypotheses and helpful suggestions for significant investigations.”

The purpose of review of literature here is to determine what has already been done under research and to study the suggestions provided by earlier researchers for further research to avoid the duplications. It is extremely important part of any research as it showed what other researchers have already done and what other researchers are doing contemporarily. Further, it provided the knowledge about the areas to be studied and need of further studies. The purpose of a review was to study earlier researches, their findings and suggestions provided by them to help further in defining the research problem and also to develop of the hypotheses. In other words, it basically helped the researcher to find out various research gaps. It provided the information related to methodology, tools used for data collection and technique applied for the data analysis. Thus it provided a critical review and appraisal of the related studies and showed how the related studies contributed towards advancing the present knowledge regarding the specific area under investigation.

Review of Related Literature

For the purpose, many studies are reviewed here. The studies have been classified into following categories.

a. Researches conducted in India

b. Researches conducted Abroad

a. Researches conducted in India

Krishnan (1983) developed a multi media package for teaching a course on audio visual education. He studied the effectiveness of programmed slides, non-projected visual aids, self-instructional material with manuals for practical exercises, self evaluating unit tests. He also used a single group approach. It was found that
multimedia packages were more useful as compared to regular classroom teaching.

Vardhini (1983) developed and tried out multimedia instructional strategies for teaching science in secondary level. She also used a single group approach for research. The findings of her study revealed that visual projections with teacher explanation & those with typed commentary were equally effective in terms of achievement. Further, she concluded that, systematically validated multimedia strategies can be implemented at school level for achievement of different instructional objectives.

Prabhakar (1989) conducted a study on development of software for the computer aided instruction (CAI) and its comparison with traditional method for teaching semiconductors at +2 levels. The CAI was developed using BASICA. The CAI package impacted positively and significant difference was found between achievement scores of students belonging to class 11th. In self learning and tutor based learning mode. Also the reactions of the students were impacted by it. The gender did not influence the effect of interaction between treatment and gender on achievement. Both 11th and 12th class students were found equally favorable reaction towards CAI material.

Himani (1990) conducted a study on the development of computer aided instructional material (CAIM) for class VIII. The developed CAIM proved to be quite effective through the significant gain of the students. Also the students were found positive reactions toward the CAIM.

Jaymani (1991) developed a CAI in physics for class XI students. The experimental group underwent through CAI and after the experiment it was found that experiment group performed better
on the posttest. The difference was significant in terms of the gender and medium of instruction.

Wagh (1991) developed a multimedia instruction system for remedial purposes for fractional members and has expectedly found that this package leads to better understanding than the conventional remedial method.

Sharma (1993) developed a course on educational statistics as per syllabus of M. Ed of Himachal Pradesh University. It was found that the experimental group performed better than the control group.

Ramsey (1996) compared the learning outcomes of three methods of instruction: a text based instructional system and two multimedia systems. The first multimedia system used a topic oriented interface whereas the second multimedia system presented a problem solving context. The research revealed that there were no significant differences between the three instructional methods for the two domains or the combined score during either the original learning session or the retention session of the experiment.

Das (1998) conducted a study on the effectiveness of computer assisted learning materials on rhymes in different modes. The sample included second grade pupils, which was selected randomly. The design of study was development cum experimental in nature. The tools used were treatments tool and testing tool. The finding of study revealed that computer, as a potential medium, significantly contributed the realization of the objectives of the study and also computer assisted teaching material developed by the investigator ensure higher learning in all areas of language development.
Khirawadkar (1998) conducted a study on the development of computer software for learning chemistry at class XI. The investigator had taken the sample of students through randomization method for both control and experimental groups. The students of experimental group were taught through traditional method by school chemistry teacher. The time duration was one month for both groups. The investigator had collected data of achievement through pretest and post-test. The data about attitude towards package were collected through straitened and untrimmed interview schedule. The findings of the study revealed that the CAI was effective in terms of academic achievements of students and instructional time, the teacher and students have positive attitude about developed CAI. Achievement of students was affected by IQ, academic motivation and attitude.

Sunilkumar (1998) studied the effects of self learning modules on achievement of senior secondary students in relation to their sex & plan of residence. It was found that the sex accounted for different achievement in economics. Male students got significant by higher mean post achievement test scores than female students. Students belonging to both rural & urban achieved almost identical scores and no significant interactional effect was observed among mode of instructional (exposure through self learning modules & conventional teaching), gender & place of residence.

Pandya and Chaudhary (2000) studied the effectiveness of CAI package by comparing face to face mode. The pretest-post test design approach was followed in this research. It was found that the achievement scores of the students learnt through CAI were better than face to face mode. It was concluded that CAI has
the potential for improving student’s achievement scores. The re-
searchers further suggested that the teaching with CAI has higher
positive effect on achievement of students in learning. The re-
search concluded that there is a necessity to use innovative meth-
ods of teaching by the teacher to keep the students attentive in
teaching learning process.

Kandasam (2001) conducted a research by which it is stated
that learning mathematical concepts through video film can in-
crease the rate of learning. It was also found that video instruction
program can make the learning more concrete and effective and
moreover, it makes the learning more interesting and realistic.

Sureshkumar (2001) discussed the use of internet for CAI, to
perform teaching and learning collaboratively. He explained the
four motivational factors influencing learning in hypermedia envi-
ronments. The study revealed that the motivation in needed to
make the students use multimedia in their day to day learning
process. When multimedia was used by learners, it was found that
there was high level of interests generated among the students who
scored more than the scores obtained by students in regular learn-
ing.

Kashinath (2002) investigated CAI interaction effect locali-
ty (urban / rural) on Guilford's evaluation of semantic abilities.
The findings revealed that urban students showed a greater num-
ber of strength in all the selected factors than rural students. In the
evaluation of semantic abilities, boys outperformed girls. Urban
boys were significantly better in their performances than the rural
boys and girls. Urban girls showed a better performance on eval-
uation on semantic abilities than the rural boys and girls.
Muthukumar (2002) conducted a study and explored that the principles of cognitive psychology influenced the multimedia interaction strategies in the design phases. It also influenced working memory with visual and auditory channels and a long-term memory for storing multiple schemas. It was also revealed that purposeful instructional program of multimedia can be effective in different learning environments.

Vasanthi (2002) studied the effectiveness of teaching chemistry for 1st year B.E students through CAI. The analysis revealed that there was a significant relationship between pre and post test scores taught through the two technologies namely traditional and CAI. It was concluded that the teaching chemistry through CAI was found to be more effective irrespective of the units under study.

Ambasana (2004) developed and examined the effectiveness of computer aided personalized and peer learning methods in 8th standard students. The selected topic from science was utilized as a multimedia slide show prepared with MS PowerPoint programme. The sample included 60 students in this experiment and the obtained data was treated with Mann-Whitney U test. There were four groups, two each (control and experimental) in experiment and replication groups, and each group consisting of 15 students. It was found that computer aided learning is best suitable for the students.

Bhutak (2004) developed, compared and studied the effectiveness of Multimedia Package for science subject of standard IX. The effectiveness was tested with two groups post-test design with scores of achievement test in science. He compared the experimental group with control group. The experimental group was given the treatment through Multi-media Package and the control group stud-
ied through lecture method. The tools involved post-test and opinionnaire prepared by the researcher. The descriptive and inferential analysis techniques were used to analyze the data. It was found that Multimedia package was more effective in terms of achievement and retention of science for both the groups of girls and the boys separately and jointly. Self-study material was more effective than slide show for girls, while slide show proved more effective than self-study material for boys.

Dadhania (2004) developed and examined the effectiveness of CAI program. Two groups-post test designs were implemented for research. The tools involved teacher made unit test and opinionnaire. Mann-Whitney U-test and Chi-Square technique of statistics were used for analysis. It was found that there was no significant difference between the achievement scores of the students from control and experimental group but students expressed favorable opinions towards CAI program.

Mahmood (2004) conducted a study on CAI and traditional method of instruction. It was a comparative study of the achievements in through computer-assisted instruction mode and traditional method of instruction in general science. The result revealed that the experimental group outperformed the control group in all achievement areas. Students were overwhelmed by the use of CAI program in learning the contents. They found it better mode of instruction than the traditional method.

Nagpal (2004) studied that the training inputs of instructional strategies helped in developing technical competencies related to mechanics of teaching learning process. The preparation of need based lessons helped in visualizing and organizing learner centered activities in classroom. The author stressed that the instructor
should involve variety in day to day teaching such as story-telling, discussions, audio-visuals, puppetry and folk play etc. The author further concluded that, in the present phase of time the teachers must be aware of the challenges of electronic media and information technology and their meaningful use in educational purposes.

Ranade (2004) conducted a study in science teaching through computer assisted instruction. The objective of the study was to find out if computer assisted instruction (CAI) has the potential to bring about increased achievement in teaching of science in the Indian context and how it compared to general classroom teaching. Single group and control/comparison group and pre test & post test designs were used. The CAI mode was compared with regular classroom teaching. Retention of content over time was also studied. The findings revealed that designed CAI had greater impact on learning. Face to Face mode impacted when the teacher was capable to involve variety in the teaching. So some students preferred traditional face-to-face teaching than CAI. The author concluded that CAI package is the best alternative where the teacher is not capable of making the students understand the contents well.

Badiyani (2005) developed and tested a Computer Aided Language Learning (CALL) Package for teaching of Action Verbs in English language. The researcher developed CAL material to use with the help of computer. It included CD ROM, Work Book, Handout, User Manual, Unit Test and Answer Key. The sample included 87 students from Grade-VIII were selected in the sample. The research design was 'Three groups randomized subject only post-test design'. The tools of data collection included teacher made achievement test and an opinionnaire. The descriptive and inferential analysis such as one way ANOVA, Post hoc Turkey Test and
Chi-Square techniques of statistics were used to analyze the data. It was found that the students who received instructions through the CALL Package scored significantly higher than the students who received conventional instruction and no-instruction at all.

Upadhyay (2006) developed CAI Package for teaching "Classification of Animals' of Science and Technology. Multimedia package was developed by the researcher. The sample included 58 students selected from standard X. The obtained data were analyzed by using t-test. At the end, it was found that students who received instructions through CAI Package scored significantly higher than that of the students who received conventional instructions. It was concluded that students had favorable altitude towards using multimedia packages for learning.

Pirasa (2008) studied the effects of computer assisted instruction on students’ attitudes towards science courses. The studies reviewed with regard to the effectiveness of CAI revealed that with regard to different subjects like sciences and mathematics, CAI was found effective in terms of students’ achievement at school level. Further, it is worth noting that CAI was found effective not only for cognitive aspects but also for affective dimensions such as attitude, interest and behavior pattern.

b. **Researches Conducted Abroad**

Jones (1980) studied the teaching of chemistry by means of video cassettes by employing computer graphics. The results indicated that the instructional video tapes, employing computer animated graphics could be used to teach chemistry if presented under conditions which are conductive to learning and if subjected to developmental testing, to assure student learning.
Waugh (1984) studied the effect of microcomputer administered diagnostic testing on the short term and long term achievement of high school students with varying levels of academic aptitude and achievement motivation. It was found that microcomputer administered diagnostic testing could positively influence short term but not long term biology achievement. Students of varying levels of achievement motivation did not exhibit differences in biology achievement and the effects of microcomputer administered diagnostic testing were consistent, across the levels of achievement motivation.

Ybarrondo (1984) conducted a study of the effectiveness of computer assisted instruction in the high school biology classroom. This study ascertained whether or not computer assisted instruction (CAI) enhanced the quality of the educational experience and resulted in increased learning. The study involved the teaching of a three week instructional unit on population genetics and evolutionary processes to advanced placement biology students. The research findings indicated that students enjoyed the CAI experience, felt that they had learned from it and would like to participate in CAI lessons in the future.

Carrier (1985) studied microcomputer programmed remediation of specific reading and writing skills deficiencies in secondary school students. The results of the study indicated that the microcomputer treatment evoked significantly greater gains than non-reinforcing treatments.

Collins (1985) found the effectiveness of computer delivered correction procedures on low performing secondary school students’ reasoning skill. The study compared two types of corrective feedback for teaching complex cognitive skills: one, receiving elab-
orated corrections and two, receiving basic corrections i.e. receiving correct answers for their feedback. The results indicated that students in the elaborated correction group felt that they could analysis arguments better than the basic correction group.

Perkins (1985) studied the effect of microcomputer on the critical thinking skills of middle school students. The purpose of this study was to determine whether teaching critical thinking skills with the microcomputer produced a greater increase in the thinking skills of middle school students than teaching critical thinking skills with conventional methods. The findings of the study indicated that students in treatment group who received instruction in verbal analogies achieved significant higher gains than the control group. No significant difference was found between control, microcomputer and conventional groups on logical reasoning, inductive / deductive reasoning or scholastic aptitude were found between the three groups as a result of instruction in critical thinking skills.

Podolski (1985) studied the effect of CAI on the performance of elementary students. The purpose of this study was to investigate the effect of computer assisted instruction on the performance of elementary students in the area of language arts skills. In particular, the study was an attempt to examine the performance of students receiving computer assisted instruction on compound words, prefixes, suffixes, and dictionary skills compared with the performance of those receiving only regular classroom instruction. This increase in performance by the experimental groups was seen as an indication that CAI programs, such as the ‘Word Breaker’ program, are effective learning aids when used in conjunction with regular classroom instruction in the language arts curriculum. A significant gain was achieved by one experimental group for the task of categoriz-
ing in the ‘Dictionary Hunt’ program. When the gain scores of this experimental group were compared with the control group at the same school, there was a significant difference in favor of the experimental group.

Johnson and Stanne (1986) studied the effect of computer assisted cooperative, competitive and individualistic instruction in terms of achievement, student interaction and attitude of eight grade students. It was found that computer assisted cooperative learning promoted the ability to apply facts in test questions requiring higher level reasoning and solving tasks, involving mapping and navigation.

Liabre (1987) studied the effect of a computer administered test on anxiety and performance of student at college level. The results on test anxiety scale indicated significant differences in anxiety level. It was concluded that the computer administered testing could potentially increase test anxiety and depress test performance of examinees that were relatively unfamiliar with computers.

Meyer (1987) carried out a comparative analysis of the value of intrinsic motivation in computer software in the mathematics achievement, attitude and depth of involvement of underachieving students at secondary stage of education. The study revealed that there was no significant difference in the academic achievement and attitude between the control and experimental group.

Niemice and Walberg (1987) carried out a critical examination of CAI. It was found that the learning through CAI is comparable to learning that takes place through the live teachers’ teaching, learning through CAI is time saving. Students responded favorably towards computer aided instruction because computers could be used to accomplish impossible versatility in branching and individ-
ualizing instruction, where true and natural instructional dialogue was possible and computer could virtually perform miracles in processing performance data. The most valuable finding was that many students gained mastery status in a short period of time.

Nordstrom (1988) conducted a review of research on the effectiveness of CAI. This review of research examined the effectiveness of computer assisted instruction (CAI) in raising the achievement levels of students at various levels and areas of instruction. This was a study to examine the relative effectiveness of computer assisted instruction in raising the achievement levels of students at various levels and areas of instruction. The review of literature suggested that a major obstacle in providing more effective computer aided instruction was the lack of good software. The literature also suggested that the tremendous amount of efforts and expense has gone into the creation, utilization and evaluation of computer assisted instructional software packages. The research had failed to detect any significant difference between achievement levels attained by students using CAI and students using more conventional paper and pencil, self paced, auto tutorial or programmed instructional materials.

Rowland (1988) studied the effect of mode of CAI and individual learning differences on the understanding of concept relationships. This study sought information that would help teachers and software developers understand how CAI could assist learners in developing a greater understanding of concepts by determining whether computer simulations are superior to tutorials in helping learners develop concept understanding as treatment and half to a simulation treatment. In this study, the effect of mode of CAI was examined for its main effect and its interaction with four constructs
of individual differences (discrimination skill, field orientation, locus of control and learning strategy) on two dependent variables measuring concept understanding and application. The following conclusions were supported by the data. When concept understanding was measured with an achievement test, tutorial CAI was superior to simulation CAI. When concept understanding was measured using an application test, no significant difference was found between the modes of CAI.

Sanwal (1989) conducted a study on the reactions of students towards computer aided instruction. Scientific reasoning skills were found to be enhanced after using a computer based curriculum. The students were found positive towards the computer application for problem solving. Specialized computer programs helped the students to develop inquiry skills.

Donglas (1990) studied computer assisted instruction for students with mild handicaps. The study indicated that well designed computer assisted instruction (CAI) can be an effective instructional medium for students with mild handicaps. Among findings of specific studies were: shorter vocabulary lists led to faster total mastery; computer based simulations used for review and practice were more effective than conventional instruction in providing students with practice solving health problems; elaborated feedback (showing student all steps necessary to arrive at the correct answer) was more effective than simple corrective feedback in improving generalization and transfer of new knowledge; direct teacher instruction appeared necessary for tasks combining verbal and mathematical reasoning and videodisc instruction was highly effective in teaching fractions.
Gardner (1990) studied the effects of CAI and hands-on activities on elementary students’ attitudes and weather knowledge. The purpose of this study was to determine if a combination of computer assisted instruction (CAI) with hands-on science activities would significantly enhance students’ abilities in the cognitive and affective domains. It was found that hands-on activities increased understanding and more positive attitudes.

Jayamani (1991) carried out research work for M.Phil. project. The objective of this study was to find out the effectiveness of the simulation model of teaching as compared to the traditional method and to utilize the growing use of computers in education. This experimental research involved in two-group pre-test and post-test design and the teacher made achievement test was used as tool. The descriptive and inferential statistics were used with t test. The researcher found that the experimental group performed significantly better than the control group.

Jehuda (1991) studied training students in the use of computers in science classrooms. In this study a program for using computers in science classrooms was developed and implemented in a pre-service training course for 31 secondary biology teachers. The effects on student teachers’ attitudes were investigated. The program included a sequence of activities in which student teachers became acquainted with the use of relevant software in their subject matter and critically discussed how to integrate the computer assisted instruction (CAI) into an existing curriculum in their science classrooms. Data obtained in a posttest attitudes questionnaire were compared with the pretest data and analyzed with a t-test. Student teachers’ attitudes became significantly more positive towards the use of CAI in high school curricula.
Singh, Ahluwalia and Verma (1991) conducted their research with an objective to examine the effectiveness of CAI program in relation to traditional method in mathematics teaching. The sample included 220 students of higher secondary. The tools like teacher made achievement test and mathematics attitude measurement tests were used in this research. The obtained data was computed with ANOVA and t tests wherever applicable. The researchers found out that (1) the students, who used computer scored significantly higher than those taught mathematics through the conventional method, and (2) Students who used computer showed significantly high favorable attitude towards mathematics than who did not use the computer.

Rose (1992) conducted research work with the objective to develop CAI software to find out the effectiveness of CAI with Teacher Support System (TSS) and CAI without TSS. The variables viz., sex, locale, IQ and achievement level were included in the study to find out the interaction of the learner variables and the treatment on the achievement score. The sample included 96 students of standard IX. The tools included teacher made achievement test, culture fair intelligence test of Cattell and Cattell, study habit inventory of Patel and mathematics study attitude scale of Sundarajan were used as tools. The obtained data were treated with descriptive and inferential statistics like t test, chi-square test, one-way and two-way ANOVA wherever applicable. The findings of the study indicated (1) Both the CAI strategies were superior to the traditional methods of instruction and CAI with TSS was more effective than CAI without TSS for underachievers and (2) Except achievement level, all other learner variables combined with the treatment had no interaction effect on the achievement score.
Burchfield (1995) studied the effect of computer assisted instruction on the science process skills of community college students. The objective of study was to develop a CAI module to improve the integrated science process skills of community college students. Additionally, the study sought to determine what effects the program had on students integrated science process skills. The sample contained 92 students of community college. The overall instructional objective was to improve students integrated science process skills. The purpose of this study was to develop a CAI module designed to improve the integrated science process skills of students and to determine the effect of the program on the students’ skills. The findings suggested that the CAI module was not effective in significantly improving the integrated science process skills of the students. The finding indicated that the CAI module can be used to effectively improve students graphing and data interpretation skills. It also indicated that the relative effectiveness of CAI module was not influenced by students’ academic aptitude.

Inoue (1995) studied the determinants of the use of CAI at a University of Singapore. The purpose of this study was to identify and prioritize the factors influencing the university faculty's use of CAI. The survey questionnaire was constructed and administered to faculty members of a leading University in Singapore. There were 58 respondents representing two groups: 26 from education and 32 from business. The results indicated that two most important inhibitors were lack of teacher's time and lack of technical support. This study attempted to rank the determinants of the use of CAI as perceived by faculty members of two schools at a leading university in Singapore.
Wilson (1995) examined the relationships among learning style. Attitude and outcomes of computer assisted instruction at university level. The finding of the study revealed that attitude of students towards CAI was positive. These findings suggested that significant learning occurs regardless of student’s attitude towards CAI. However, the researcher did not find any significant impact that CAI makes on certain characteristics of learners such as their attitude, attendance, writing quality, type and frequency of revision used, logical reasoning, inductive/deductive reasoning, problem analysis skill etc. While on the other hand, it was found that anxiety increased and it cured depression and poor results.

Pandian (1998) studied and discussed that CAI is a part of innovative approach to teaching learning process. Though computers found their place in Indian schools recently, it is not yet possible in India to use computer extensively in school curricula.

Yukiko (1998) studied the university student’s preference for learning by CAI. This study had searched for an answer to the question of whether or not gender difference is associated with academic status (equated “computer experience”) on the university student’s preference for learning by CAI. The main effect of gender was non-significant but the main effect of academic status was significant. The finding that graduate students favored CAI more than undergraduate students confirmed the assumption that graduate students have more computer experiences. The association of academic status with the CAI preference was found to be strongly positive. Although the results did not tell exactly why graduate students favor CAI more than do undergraduate students, such learning activities as using CAI gave maximum opportunities to all students with different backgrounds and academic expectation, particularly in
graduate programs. The results also did not provide empirical evidence of the existence of the interaction of student gender with academic status on the preference for CAI. However, statistical tests showed the significant differences between undergraduate females and graduate males, confirming that computer experiences have a stronger effect than gender differences on attitude toward the computer and CAI.

Barakter (2000) conducted a study on employing meta-analysis research approach. Purpose of this study was to determine whether CAI had an overall positive effect on student’s achievements in secondary and college level science education. He studied forty two different studies and compared CAI with traditional instruction in science. The study revealed that CAI has a small positive effect on students’ achievements in science education at college and secondary level.

Mintz and Campbell (2000) compared computerized and traditional instruction in the area of elementary mathematics and elementary reading. The significant difference in critical thinking skills between students learnt through CAI and students learnt through regular learning mode was found at the end. The students with CAI performed better than those who learnt to regular classroom mode of learning.

Johnson et al. (2000) compared learning methods in human resource developments and reported positive effects of technology-assisted learning. He proved that students who followed technology-assisted learning mode scored more than the other group learnt through traditional learning mode.
Piccoli et al. (2001) showed that there is comparable difference between the achievements scores of student who learnt through technology mode and face to face learning mode.

Grable and Curte (2001) examined the use of computer-related technologies in middle school mathematics and science settings. It was found that if the various technologies combined with proper judgments, it will create better impact on students learning and support better understanding of contents. They further proved that these technologies can provide satisfaction to the students who were skilled in using technologies.

Karen (2001) conducted a study about High-tech verses High-touch teachers. He suggested that they should involve technology in teaching learning process wherever it is possible. The teacher must get maximum benefits of the technology assisted learning. He stressed on five dimensions associated with effective teaching, enthusiasm and command of subject, organization, faculty/group interaction and faculty/student contact.

Karia (2001) studied the effectiveness of Computer Aided Learning (CAL) programme with relation to programmed learning and traditional teaching. The academic topic of 'Set Theory' in mathematics of standard VIII was the content for learning. Only post-test design of research was implemented which was developed by the teacher. The inferential technique of ANCOVA was used to analyze the data. It was found that Traditional Method of Teaching and Computer Aided learning programmed were equally effective for boys. For girls, traditional method of teaching proved more effective that CAL program. Programmed learning material and CAL program were equally effective for both the groups.

Steve (2001) studied the achievements of students in litera-
cy and numeric methods. The study revealed the significant difference in achievements of the students using technology for learning where teachers worked on developing their own computer skills and instructional uses of computers.

Whitley (2001) studied the role of multimedia in the instructional design of e-learning. Its influence on the design processes of digital educational content-ware was studied. It was found that the effect of digital educational content-ware was positive in terms of achievement scores of the participants.

Anthony (2002) surveyed pre-service teachers regarding their perceptions of effective teachers’ characteristics. No significant difference was found in the relationship between the perceptions and respondent’s year of study.

Dangar (2003) developed a Computer Assisted Instruction (CAI) Program for teaching unit of English of standard VII. A teacher made test was prepared to measure educational achievement of the students. The student’s reaction towards CAI program was studied through specially designed opinionnaire by the researcher. The descriptive analyses techniques were used to interpret the data of the post-test scores. The researcher found that CAI program and traditional method of teaching were equally effective. Students gave favorable response towards the use of CAI program for learning.

Granello (2003) studied the development of a CD-ROM for CAI and research. The objective of this research was to relate thoughts about CAI as a pedagogical approach for instruction and also to illustrate the process by which the authors have developed one type of CAI project. The prime reason to develop CD ROM about counseling theories was to develop an instructional exercise
for use by students that would lend itself to research. The project consisted of a CDROM for teaching counseling theories that lends itself to both instructional and research purposes.

Hirani (2003) developed and studied the effectiveness of Computer Assisted Instruction (CAI) program for the unit of ‘Circulation in Animals' in science of standard IX. The experiment was conducted for control and experimental group. Only post-test design was used for experiment. A teacher made unit test was administered for post-test. The scores obtained on the test were analyzed by Mann-Whitney U-test. The results showed that the students of CAI program group scored significantly higher on post-test than the students of traditional method.

Chugh (2004) studied CAI entree of a comparable quality to education which deprived to a large number of the disadvantaged urban slum children. The inferior quality of school emerged a major cause for the low enrolment and relation. It is observed that large percentage of children was out of school due to long stay far from their home town. They visited their hometown generally in the harvesting period only.

Hodges (2004) studied motivational techniques to incorporate in e-Learning experience” stating that self-efficacy is at the heart of motivation. It was suggested that while designing learning experiences, one should take this into consideration and make every effort to increase the students self-efficacy. He studied the other features of e-learning experience that were motivating including feedback and navigation systems. His findings suggested that the feedback mechanisms should be incorporated into the experience.

Kuo and Song (2007) compared the effectiveness of online and Face-to-Face technology applications skills in Teacher Educa-
tion. The sample included 62 undergraduate students. The survey method was followed for research where difference between achievement scores of students learning through face to face mode and technology assisted learning mode was compared. Among them, 27 students were enrolled in the online technology applications class and the other 35 students were enrolled in the equivalent face-to-face class. An independent $t$ test was administered to evaluate the difference of computer attitude between the participants in the online class and in the face-to-face class before and after taking a technology course. The results of the $t$ test showed that there was no significant difference in the computer attitude between the two different teaching formats before and after taking the technology course. It was also revealed that there was no significant difference between the online and face-to-face classes in terms of students’ attitudes toward technology.

Louange (2007) conducted an examination of the relationships between teaching and learning styles and the number sense and problem solving ability of year 7 students. The aim of the study was to explore the relationships between students’ number sense and their problem solving ability. The contribution of the teacher’s teaching style and the students’ learning style towards students’ performance was also studied. The variables were compared to their learning style, and their mathematics teacher’s teaching style. A mixed methods design was employed. A readymade index of learning style (ILS) inventory was used as a means of ascertaining the learning preference modality of both the students and their teachers. The findings revealed that there is significant correlation between students’ number sense and problem solving ability.
Zhang et al. (2007) compared the efficacy of face-to-face and computer assisted library instruction. The study revealed that technology-assisted learning can overcome the result gained by face-to-face learning mode. He concluded that differences in study, methodology and lack of quality teaching were the variables influencing the research findings. However, he suggested that there is a vide scope to study in this area of research.

Hui et al. (2008) examined effects of technology-assisted learning on learning effectiveness and satisfaction under quasi-experimental study. The sample included 212 degree students. It was found that the use of technology-assisted learning adversely affected student engagement in learning activities. Technology-assisted learning showed no significant moderating effects on learning effectiveness or satisfaction. It showed that technology-assisted learning is useful to improve achievement scores of the students.

Park (2008) compared learning outcome in conventional face-to-face lecture with the selected e-learning contents. The sample included 54 Korean agricultural high school students who were selected randomly. The difference between a pretest and posttest scores were studied. The researcher conducted a one-way analysis of covariance to verify whether there was any difference between face-to-face lecture and e-learning in terms of students’ learning outcomes. It was found that the students performed similarly in animation based and video based e-learning as well as between face to-face learning and e-learning mode.

Addis (2009) investigated the similarities and differences in the implementation of face-to-face and online versions of an undergraduate educational technology course for elementary teacher candidates. Sample included 46 students where 22 students participat-
ed in online learning mode and 24 students participated in F to F mode of learning. It was found that the face-to-face group significantly outperformed the online group on post-test scores.

Bahar (2009) studied the relationships between pupils’ learning styles and their performance in mini science projects. The Grasha-Riechmann Learning Style Scale was used to determine the pupils’ learning styles. Results showed that the pupils who were in the “independent,” “competitive,” and “participant” groups had relatively higher achievement scores in the mini projects than the pupils in the “avoidant,” “dependent” and “collaborative” groups.

Broere (2009) studied Performance and perceptions of degree college students related to Technology Assisted Learning. The study indicated that traditional method of instruction and technology assisted learning method found effective whereas he found traditional method of instruction more suitable than technology assisted learning. As far as the association between student perceptions and their performance is concerned, the study evidenced that the perceptions of students regarding the effectiveness of technology assisted learning method was not associated with their performance. Their perceptions of the effectiveness of traditional method were associated with their performance but the association was weak. Therefore he concluded that student perceptions of the effectiveness of methods of instruction are, at most, a very weak predictor of performance.

Diaz (2009) conducted a research to study the functions of teacher in e-Learning and face to face learning. The study aimed to highlight some of the possible risks and strengths which may help to improve the role of teachers in both methods. Two groups were formed for learning with face to face mode and e-learning mode.
The mixed mode of research was used for this research. The study concluded that, there was no significant different found while learning in both the methods.

Liu (2010) conducted a comparative study of learning effectiveness between traditional face-to-face learning and e-learning among goal-oriented users. The primary aim was to investigate and understand the effectiveness of e-learning. This study included the 219 students of graduate schools in Taiwan. The aim of the study was to compare the instructional differences between face-to-face learning and e-learning methods. A questionnaire for survey was designed. It was concluded that e-learning in all offers a higher level of learning effectiveness than traditional face-to-face learning. Moreover, students who used e-learning method were more satisfied on learning materials and learning environment compared to those used traditional face-to-face learning method. There was no significant difference found in using both the ways.

Fortune (2011) compared the effectiveness of face to face learning versus online learning. The purpose of this study was to measure students’ learning perceptions. The other purpose was to explore the use of leisure time and online social networking. The sample included 156 students from urban, multicultural university located in the Northern California. The researcher compared two groups (online and F2F) to evaluate the differences in achievement scores. It was found that there was no statistically significant difference between the participants enrolled in the online and F2F Recreation. Students performed better by using online mode.

Grant (2012) distinguished online and face to face learning by his research. The results from analyzing multiple data sources demonstrated that the technological acquisition and pedagogical
learning provides an appropriate framework for creation of a graduate-level program in online pedagogy. This research also demonstrated that online pedagogy is a unique field of study and cannot rely on definitions, behaviors, or training designed for face-to-face instructors.

**SUMMARY**

The TAL packages are being used in all over the world for educational purposes. In India, it is being used in many Universities, Colleges, Private Institutions and International schools also. The Amrita University, Indira Gandhi National Open University, International Institute of Technology, Andhra Pradesh and University of Mumbai has developed TAL packages at degree level. They have also developed these packages for short term courses. National Institute of Open Schooling, MHRD, Government of India, has prepared many TAL packages for learning at secondary and senior secondary level. Ministry of ICT under NME-ICT project and University Grants Commission, Govt. of India are providing funds to University Departments to prepare TAL packages in various subjects at degree level. Further, Tata Consultancy services (TCS) has developed self-learning packages for teaching basic literacy. NIIT, IIT Mumbai and Consortium of Educational Communication (CEC) have prepared TAL packages for professional courses whereas NCERT has prepared TAL packages for social awareness in rural areas in Maharashtra. Recently Govt. of Maharashtra has conducted teacher training for secondary and senior secondary teachers in online mode in the subject of Mathematics. Mumbai Municipal Corporation has provided funds to Municipal schools to develop their virtual classroom for online learning by secondary school chil-
Municipal Corporation of Navi Mumbai also provided funds to some of the educational agencies to provide online learning facilities to the students for professional courses. Some of the reputed colleges in Maharashtra and the Institute like Tata Institute of Social Sciences provided students open library access in online mode where the students can read and refer many online books of their choice. They also introduced two Masters Degree Program and Certificate courses in online mode. Maharashtra Knowledge Corporation Limited (MKCL) has also developed self-learning packages in vocational courses in the areas of education and management.

**Observations about Review of Literature**

Though Technology Assisted Learning mode is being used in India at a large, their need and impact on the learner’s achievement has not been studied so far. The prior researches indicated that the studies conducted in India on TAL package, mainly focused on self-learning modules in physics, chemistry (Jones 1980, Jaymani 1990, Khirwadkar 1998, Vasanthi 2002 etc.) and its effectiveness for secondary and senior secondary level (Vardhini 1983, Sunilkumar 1998, Carrier 1985, Mayor 1987, Singh et. Al. 1991, Barktar 2002 etc.) whereas the studies conducted abroad concentrated on comparison between face to face and technology assisted learning method (Perkins 1985, Podolski 1985, Johnson 1986, Kann 1987, Grant 2012 etc.) range of web based activities, role of multimedia and TAL in teaching and learning, motivational techniques to incorporate e-learning, animation and effects of TAL.

It is observed that the researches by Kann 1987, Grant 2012 were conducted in school level. A review of the literature revealed that though there have been researches carried out in the area of

It was also observed that a majority of the researches of Das 1998, Badiyani 2005 and Podolski 1985 were conducted for language earning through TAL. The researches by Diaz and Ryan 1999, Cutolo and Regina 2007, Louange 2007, Bahar 2009 were conducted with the student in relation to their learning styles. It was found that the most of the researchers had used survey method for their research.

Researches have also been conducted on impact of learning modes on the students with different learning styles. The student’s achievements were compared in online and offline modes of learning with different learning styles at college level.

The researches (Addis 2009, Broere 2009) suggested that that Face to Face mode of learning has the higher impact on academic achievement of student’s learning than TAL mode. It was also suggested that though some of the researches proved that TAL mode is more useful for better understanding of contents, the students were very satisfied with F to F mode.

The following researches (Meyer 1987, Norstrom 1988, George 1992, Park 2008, Diaz 2009, Liu 2010, Fortune 2011 etc.) revealed that there is no significant difference between the two modes of learning viz. Face to Face and TAL mode of learning.

**Contributions of the Literature Review to the Present Research**
The review of related literature has contributed in many ways for this chapter. Most prior researches focused on academic achievement of the learners. It also compared the two modes of learning i.e. F to F and TAL mode. The researchers concentrated on the ability and effect of learning mode on academic achievements of learners. Review of the related literature, served the following specific purposes:

- The review of related literature enabled the researcher to define the limits of his field.
- It helped the researcher to limit and define his problem. The review of related literature provided the clear idea about the work other researcher have already conducted. It also helped the researcher to state the objectives clearly and concisely.
- By reviewing the related literature, the researcher could avoid unwanted and useless problems and related information.
- Through the review of related literature, the researcher could avoid unplanned duplication of data and findings.
- It made the researcher understand advanced research methodology and its perspectives. It helped the researcher to know about the tools and instruments which were helpful proved for earlier researchers in the previous studies.
- The final and important specific reason for reviewing the related literature was to know about the recommendations of previous researchers for further studies which they have listed in their studies.
- The review of literature has provided the wholesome idea to the researcher regarding the efforts of preparing the TAL packages were made by many experts at national and international level. It
pointed out the limitations of the researchers in preparing the TAL packages at school and college level.

- It helped the researcher to identify the student-outcome variables of his study viz. academic achievement of the students in the present study.
- The literature review also helped the researcher to gather related data, methodology of preparation of TAL package, information and requirements of software. It also focused on the methodology used by previous researchers to conduct research and come to the final conclusions.