CHAPTER – II
REVIEW OF RELATED LITERATURE

2.1 INTRODUCTION

The review of related literature forms the base material for the investigator to have a clear idea about the general concepts, principles and an exhaustive review for the development of the research. It implies locating, reading and evaluating reports of research as well as reports of observation and opinion that are related to the individual’s planned research work.

It helps the researcher to avoid the work that has already been done in the area. It provides the investigator with an opportunity to gain insights into the measures, objects, samples, tools and approaches employed by other research scholars.

Literature review also helps the investigator to study the different aspects of the problem. It enables the investigator to identify the research gaps if any in order to create new ground in research. So a review of previous studies in relevant area of the present study was attempted and presented in this chapter.

The knowledge gained from previous research, not only leads to greater understanding of the problem and stimulates the research worker, but also provides comparative data on the basis of which one could evaluate
and interpret new research. To be able to benefit from previous research, a survey of related literature becomes imperative.

The investigator should be familiar with the studies previously undertaken on the same or allied areas before starting any new study. It helps the investigator to understand the limitations of the previous studies, and to expand the scope of the new investigation. With these objectives in view, the investigator has reviewed some of the important studies.

Literature review also signifies the importance of the present study and the relevance of the variables chosen. It also indicates the inter links and gaps filled between the other studies and the present study.

2.2 STUDIES RELATED TO MULTIMEDIA PROGRAMME IN TEACHING IN INDIA AND ABROAD

Bhattacharya (1989) evaluated the status of teaching of chemistry with the help of computers. The objective of the study was to develop the tools for evaluating the effectiveness of available software in chemistry. The result indicated that the available software in chemistry were of good quality. Computer-assisted instruction could be applied most effectively to an individual or to small groups; the softwares that have been selected for classroom teaching mainly provided simulation of a real situation thereby assisting students in long-term retention.
Bhardwaj (1990) studied “Development of Computer Aided Instructional Material on Microbes for class VIII”. The objectives of the study were: i) to study the effectiveness of computer aided instructional material for teaching microbes in terms of achievement, and ii) to study the reactions of students towards computer aided instructional material. CAI was found to be effective and interesting. Students reacted favorably towards CAI.

Chiu, Mei-Hung (1990) studied the effectiveness of Microcomputer-Based Laboratories (MBL) in teaching scientific skills and concepts in four seventh grade classrooms. The result revealed that students had significantly greater acquisition of scientific concepts in the MBL groups than in the control group.

Canaday, Kathlyn Yvonne (1991) determined and analyzed the changes in knowledge and attitudes of a selected group of sixth-grade mathematics teachers following the use of computer and student-oriented software. The results showed that a significant difference exists between the pre test and post test scores on mathematical knowledge and between the pre test and post test scores of attitudes toward mathematics and problem solving.

Huang and Aloi (1991) investigated the impact of using interactive video in teaching general biology. Biology undergraduate students using a computer-assisted interactive videodisc system which included dissection simulations performed significantly better than students who had not used the computer-aided instruction.
Jeyamani (1991) studied the effectiveness of the simulation model in teaching physics to standard XI students through Computer Assisted Instruction (CAI). The result indicated that the experimental group obtained a higher mean than the control group. On the basis of the research findings, it was concluded that the experimental group performed significantly better than the control group.

Kalimuthu (1991) developed a video programme on environmental pollution in biology for higher secondary students and investigated whether students in higher secondary schools, who are taught environmental pollution in biology by the video method, achieve more than those who are taught by the traditional method. The major findings were that the higher secondary students taught through the video programme learnt more of the concepts on environmental pollution than those who were taught by the lecture method. The higher secondary students improved their performance in environmental pollution after viewing the video programme.

Purushothaman and Stella (1991) proved in their study that computer assisted instruction group performed significantly better in mathematics learning and that the time taken by the computer assisted instruction group was nearly two-thirds of the time taken by the traditional group to complete the instruction on the selected topic. Also in another study they found out that the CAI was more beneficial to the low and average achievers than the high achievers.
Wagh (1991) developed a multi-media instructional system for remedial measures for class VIII students, in fractional numbers. The multi-instructional system contains charts, flash cards, film-strips, audio-cassettes, assignments, and a self-learning programme. The results revealed that the Traditional Instructional System (TIS) and the (MIS) remedial approaches both helped students in improving their performance on all the six computational skills in fractional numbers.

Geban, Askar and Ozkan (1992) studied the effects of computer-simulated experiments, problem solving, and conventional approaches on high school students’ chemistry achievement, science process skills and attitudes towards chemistry. The results indicated that computer-simulated experiments and problem solving produced greater achievement in chemistry and science process skills. Computer-simulated experiments produced more positive attitude towards chemistry.

More and Ralph (1992) investigated the effectiveness of courseware in a college biology class. Biology knowledge of about 92 undergraduate biology students using computer courseware increased more than that of approximately 92 students using traditional animal-based laboratories.

Morrell, Patricia (1992) determined differences in effectiveness of computer-assisted instruction (CAI) compared to traditional instruction of general biology students (n=54) for units on photosynthesis and introductory genetics and to assess students attitudes toward CAI. Results
indicated that CAI tutorials are no more or less effective in promoting student achievement, and the photosynthesis group preferred CAI.

**Olson, John (1992)** used computer assisted instruction in a unit on fire which included a computer simulation of combustion. Sixteen students were interviewed about the actual study of combustion and the simulation of the process on the computer, and their attitudes towards classroom experiments versus computer simulation were noted. The result indicated that although simulations can contribute to conceptual change, they must be used in conjunction with traditional teaching methods.

**Stella (1992)** studied the impact of Computer Assisted Learning (CAL) material developed on the topic “The language of Sets” in Mathematics, on the underachievers, normal achievers and over achievers. The main findings of the study were: i) CAL was an effective individualized instructional technique that helps underachievers reach their optimum expected level of achievement, ii) It was found to be more effective for underachievers than both the normal and over achievers in terms of achievers in terms of achievement, iii) it was clearly seen that some of the normal achievers could be helped to become over achievers and the over achievers too could be helped to score better, though their gain was not found to be statistically significant.

**Kinzie, Strauss and Foss (1993)** investigated the effects of an interactive dissection simulation on the performance and achievement of high school biology students. Findings suggest that an interactive
videodisc was at least as effective as actual dissection in promoting high school student learning of frog anatomy and dissection procedures.

**Bitter, Gary and Hatfield, Mary (1994)** conducted a study on “Training elementary mathematics teachers using interactive multimedia”. Two studies were conducted wherein an interactive, multimedia-based instructional system was piloted with pre service elementary school teachers. The results of study indicated that this mode of presentation enhanced their learning of mathematics teaching methods and their teaching in other fields.

**Dori, Yehudit and Yochim, Jerome (1994)** developed and used a studyware comprising a set of interconnected modules on human physiology to improve undergraduate students' achievements. The results of the study showed that the scores of those students who used the optional computer laboratory sessions were enhanced over those who did not use the studyware.

**Large et al. (1994)** studied the influence of multimedia on learning. There is a widespread assumption that the addition of still images, animation and sound to text will enhance any information product. The research reported in this paper is investigating such claims for multimedia in an educational context and for a specific user group: grade-six primary school students. The findings of the study suggest that the impact of multimedia is subtle. Multimedia produced the greatest relative improvement in recall and inference levels. Students who have seen only the text are the most successful at recalling what they have read. The
addition of animation to a text produces more impact on inference than on recall, and the multimedia group of students scored higher than the others on inferencing. The study indicated that multimedia demonstrated a clear advantage over text alone.

**Lilienfield and Broering (1994)** conducted a study on “Computers as teachers: learning from animations”. The results showed that medical and graduate students who used computer simulation achieved a significantly higher grade in the cardiovascular section of the final exam than their classmates.

**Suits and Lagowski (1994)** conducted two studies to determine the effect of inductive and deductive computer-simulated experiments on problem-solving abilities in introductory General Chemistry. No significant differences were found among the groups of reasoners on three cognitive levels of the final examination.

**Burchfield, Michael Leonard (1995)** developed a computer-assisted instructional module to improve the science process skills of community college students and additionally studied the effect of the CAI module on the students’ integrated science process skills. There was no significant difference between the mean gain in integrated science process skills of those students who participated in the computer module and those students who did not participate in the module.
Farr, Pamela Lynn (1995) presented a potentially powerful new approach “Microcomputer based laboratories” to science laboratory instruction. The results showed that students at the secondary level has indicated that Micro computer based laboratory (MBL) may have positive impact on student acquisition of graphing skills, science content knowledge and science process skills.

Haddon et al. (1995) studied “Can Learning Via Multimedia Benefit Weaker Students?”. Second year undergraduate students were taught either by conventional methods or by a multimedia package. Use of and attitudes to the package were generally positive. The results suggest that multimedia is a popular and effective method of teaching and is more successful than conventional methods for students of below average ability.

Mahapathra (1995) developed a software package for teaching chemistry and studied its effectiveness in terms of students’ achievement on a criterion test. The investigator also compared the scientific attitude scores of students taught through the developed software package with those taught through the traditional method. Developed software package was found to be effective in terms of achievement of the students on a criterion test. Seventy five percent students achieved more than sixty percent of marks. The developed software package was not found to be superior to the traditional method when assessed in terms of scientific attitude scores of the students.
Parker, Zoann (1995) examined the performance and attitudinal effects of a computer disk earthworm dissection program as compared to the traditional high school biology dissection methodology. Scores from the pre and post tests were examined for both groups. The result indicated that no statistical difference was found in knowledge gained and retained between the two groups.

Beerman, Kathy (1996) found that college students taught by interactive multimedia had greater long term retention compared to students taught by traditional methods. The same research concluded that from the students’ point of view, multimedia is effective.

Chanlin, lih-Juan and Chan, Kung-Chi (1996) studied and explored the instructional impact of using Computer Multimedia to integrate metaphorical verbal information into graphical representations of biotechnology concepts. The combination of text and graphics into a single metaphor makes concepts dual-coded, and therefore more comprehensible and memorable for the student. The results suggested that animated graphics plus metaphorical treatment enhanced motivation the most.

Fisher-Stitt, Norma Sue (1996) studied the effect of an interactive multimedia computer tutorial on students’ understanding of Ballet “Allegro” terminology. It is found that the difference between the groups attained statistical significance on the overall written test score and the overall written and practical understanding of ballet allegro terminology. For both groups, there was a high positive relationship between overall written and performed understanding.
Gunn and Maxwell (1996) evaluated the impact of introducing a generic, computer assisted learning (CAL) program in human anatomy for medical education. The result indicated that use of different media resources facilitated complementary aspects of learning. Both staff and students were able to use their time more efficiently, and an improvement in the overall quality of learning was noted. This was partly attributed to high motivation and interest levels that resulted from the use of the CAL program, and partly to the holistic approach supported by the combination of resources.

Kettanurak, Vichuda (1996) studied the degree of interactivity in an interactive multimedia instruction program. It is found that 1) students have more positive attitude if they use an interactive program rather a non-interactive one 2) interactive program does not necessarily influence students learning achievement.

Reddy et al. (1996) investigated the effectiveness of multimedia based modular approach in teaching English to slow learners. The findings of the study indicated that the achievement of experimental group slow learners was higher than the achievement of control group slow learners.

Shanmugasundaram and Stella (1996) studied the effect of computer assisted instruction on learning English grammar. They found out that the computer assisted instruction group performed significantly better than the control group that was taught by the traditional method.
Warschauer, Turbee and Roberts (1996) examined whether computer networks are indeed an effective tool for empowering second-language learners, focusing on three aspects: autonomy, equality and learning skills. They concluded that computer learning networks do have the potential to empower students when they are used appropriately, and provided some pedagogical suggestions for the effective use of computer networking in the second- and foreign-language classroom.

Callaway, Judith Ann (1997) studied an interactive multimedia computer package on photosynthesis for high school students based on a matrix of cognitive and learning styles. It was found that the experimental group performed significantly better than the control group on two separate tests on photosynthesis, one multiple choice and the other short answer.

Christmann, Badgett and Lucking (1997) indicated that the average students receiving traditional instruction supplemental with computer assisted instruction attained higher academic achievement than those receiving only traditional instruction.

Frear, Valerie (1997) examined the level of student involvement with the content of science-based interactive multimedia as measured by achievement, attitudes and higher level thinking skills. The preparation of students with a passing grade was higher for those in the treatment group than those in the control group. Experimental group students achieved significantly better grades when compared to traditional students in a science class.
French, Dorothy (1997) studied a CAI using interactive software versus traditional instruction in a college pre-calculus course. It was concluded that the use of interactive computer software does increase the mathematics achievement of students.

Garnett, Hackling and Oliver (1997) designed Interactive Multimedia Package to improve students' understanding of the particulate/molecular basis of chemical reactions, and their ability to balance and interpret chemical equations. The results of study indicated that the provision of concrete representations of unobservable entities and processes, and the use of an interactive approach with associated feedback facilitated students' achievement of scientifically acceptable conceptions of chemical equations and their application.

Jawad, Afif (1997) studied the impact of computer based interactive instruction in improving the teaching-learning process in introductory college physics. Computer as an instructional delivery system is an alternative that may result in a higher level of student learning for many higher education courses.

Joshi, Anuradha and Mahapatra (1997) compared the developed software package with traditional method in terms of reasoning ability in Science by considering intelligence as a co-variante. The results showed that the students taught through developed computer software package were significantly higher in the reasoning ability than the corresponding figures for those taught through traditional method.
Ng (1997) conducted a study on “Teaching effectively with visual effect in an image-processing class”. The objective of this study was to propose a highly effective computer-based teaching method in an image-processing course. With the multimedia technology, it is easy to implement an innovative teaching method using computer to attract student attention in the image-processing course.

Rangaraj (1997) developed a syllabus based computer software package in teaching physics at higher secondary level and studied the effectiveness of Computer Assisted Instructional in teaching Physics at higher secondary stage. The analysis of the data revealed that there was significant difference between the means of pre and post test in physics among controlled and two experimental groups at all the levels of cognition in favour of the posttest.

Ross, Sutherland and Kennedy (1997) developed an Interactive Multimedia Learning Resource called ‘WoundCare’ for Health Professionals to facilitate effective learning of wound assessment and treatment. Its intention is to provide students with the opportunities this form of learning affords will help to eliminate the 'hit and miss' associated with the learning of technical procedures using traditional teaching-learning strategies. If this can be achieved, students will be better equipped to transfer their learning into the clinical setting.

Stewart and Gregory (1997) discussed the benefits of using multimedia Computer Assisted Learning (CAL) as an alternative teaching method. CAL packages may provide more flexibility in the course design,
encourage student-centered learning and help students of differing abilities and academic backgrounds. They also examined problems associated with the use of multimedia CAL such as the provision of computer facilities and software purchase.

**Tajudeen (1997)** found out that the learners taught through computer assisted language learning scored better and had favourable attitude towards computers than the learners taught through conventional method in English grammar. Further, the study has found out that there is a positive correlation between the attitude towards computers and the achievement score of the experimental group.

**Taylor, Violette** (1997) studied the effect of computer simulation and experiments on sixth-grade students learning in science. It is found that the students scored higher on a post test than a pretest after participating in the experiment. Further, the students increased their understanding of scientific concept due to hands-on instruction and computer assisted instruction. The response of the teacher and the students towards the computer software being used was positive.

**Anandan (1998)** found that computer assisted instruction had produced significant positive effect on the achievement of students in Indian Economics when compared with traditional method. Significant favourable achievement was observed in the components of knowledge and comprehension but not in application.
Beerman, Brown and Evans (1998) found that there was a significant benefit of new technologies, as opposed to traditional texts, and hence it is better to allow students to learn in their own style and at their own pace. An additional argument is that CD-ROM provides media and visually rich material that is more likely to correspond effectively with students’ individual learning styles.

French and Rodgerson (1998) developed, trialed, refined and implemented a multimedia computer package, called Gecko. Gecko provides easy-to-access, accurate information whilst encouraging independence in learning. Gecko provides all the necessary information required to complete the task and enables students to work individually at their own pace through the series of tasks in each practical. The result indicated that the majority of students feel that these practicals helped them achieve their learning outcomes and that they were able to engage with the subject material more than in other practicals.

Orman, Evelyn (1998) investigated the effects of development and implementation of an interactive multimedia computer program on the achievement and attitude of 44 sixth-grade saxophonists. For 3 weeks, the control group participated in band, while students in the experimental group individually worked on the computer program during 8-15 minutes of their daily band class. Findings indicated that experimental students demonstrated significantly higher levels of perceived knowledge and performed significantly better than did control students on written and videotaped assessments. Data suggest that proper development and
application of educational multimedia computer programs may benefit instrumental education.

**Perry and Perry (1998)** concluded that multimedia can improve student learning in a positive manner. In this study they reported that when multimedia was used more material was covered, they were able to understand difficult concepts better and retained course material better.

**Sethuraman (1998)** conducted a study on “Effectiveness of computer Assisted Instruction in Teaching Chemistry at Higher Secondary Level”. The results of the study showed that the students of the experimental group show a better performance than the control group.

**Speelman, Pamela (1998)** studied the effects of computer generated text slide with animation on short-term retention of knowledge. It was found that there was a significant difference in the achievement scores of post test between the treatment groups’ receiving animation and those receiving no animation. Gender and age as covariates to the dependent variables or the two post test showed to have no significant effect.

**Cox, Robert and Killingsworth, Clifford (1999)** studied the impact of Multimedia-Based Instruction on Learning and Retention. The findings indicate that multimedia-based, self-paced learning offers very distinct advantages over traditional, instructor-led classroom learning. Overall, both the high-school and university student groups involved in the study exhibited superior retention rates when learning from the multimedia-based
materials. Higher scoring students in the classroom showed little difference in either media, while students who tended to score at the low end of the grading scale uniformly scored higher on multimedia-based materials. The reduced variation in student performance based on test scores in the CD-ROM instruction indicates the positive effects of multimedia-based instruction.

Frear and Hirschbuhl (1999) examined the effects of Interactive Multimedia instruction upon the variables of achievement and problem solving skills on non-science majors in an Environmental Science course at a Mid-Western University. The findings indicate that the Interactive Multimedia had a significant effect on both the variables.

Korfiatis et al. (1999) studied the effectiveness of computer simulation programs in enhancing the familiarity of biology students with ecological modeling and ecological concepts. The results, expressed in mathematical form showed that computer simulations improved the comprehension of ecological processes. Thus, a balanced teaching procedure, involving both simulation programs and textbook-based lectures, is considered more appropriate for the teaching of ecological theory.

Batchelder, John and Rachal, John (2000) studied the “Efficacy of a computer-assisted instruction program in a prison setting”. Achievement scores of inmates in the experimental group were not significantly higher than those in the control group.
Brown, Frank (2000) conducted a scientific study of the effect of CAI on mathematics achievement. The study demonstrated that the students who utilized the CAI scored significantly higher than the students who did not participate.

Dharmappa, Corderoy and Hagare (2000) developed an interactive multimedia software package to enhance understanding of and learning outcomes in water treatment processes. The software package incorporates several different media modes including text, drawings, photographs, animation, and simulation. The preliminary pilot evaluation of this package using third year engineering students indicated that it provided greater insight and understanding of the complex treatment processes being taught.

Dooley, Kim et al. (2000) examined the use of animation as a learning tool for complex, life science content in a College of Agriculture and Life Sciences upper-division course. This study supports animation as an asynchronous learning tool to improve cognitive understanding, student performance, and student self-efficacy for continued learning throughout a lifetime.

Hitchcock and Noonan (2000) studied “CAI of early academic skills”. The results suggested that CAI is an effective means of promoting attainment and maintenance of pre academic skills in young children with disabilities.
Panda and Chaudhury (2000) determined the degree of attainment of cognitive skills through computer assisted learning (CAL) compared to traditional approach to teaching and compared the effect of CAL on the learning achievement of boys and girls. Data analysis indicated that 1) the computer assisted learning (CAL) resulted in greater learning achievements in all hierarchies of cognitive domain, 2) Male students were found to be superior to female students in learning physics. The results established the superiority of CAL over traditional approaches.

Thilaka Suresh (2000) developed a CAL programme ‘BIOTECH’ to teach the basic principles of Biotechnology and studied the effectiveness of Tutorial ‘BIOTECH’ CAL package in attaining the content objectives when used independently by students and examined the influence of this instructional strategy change on the achievement in Biotechnology. The results of the study showed that the CAI strategy has a significant influence on the achievement in biotechnology, under the influencing conditions of students’ receptivity, computer familiarity, Biology proficiency and attitude towards science among the total experimental group students. And also it indicated that the experimental group students had a significant favourable attitude towards science after learning Biotechnology through CAI.

Walker, James et al. (2000) developed multimedia-based resources to study human anatomy. These resources include the integration of video and audio with animations, text, and graphics. The result revealed that the greatest impact of these resources on learning will be to strengthen the student’s basic science knowledge and to provide them access to materials that integrate structural and functional components of specific
body systems as well as to use their time efficiently, foster active and independent learning while at the same time maintaining their interest and enthusiasm.

Balasubramanian and Jayaraman (2001) revealed that there is significant difference among different modes of computer based instruction in their effectiveness in realizing the instructional objectives. Simulation as one of the modes of computer assisted instruction is more effective when compared to tutorial and drill and practice. It is also concluded that tutorial and drill and practice are equally effective in realizing the instructional objectives.

Boudinot, Sally and Martin, Bradley (2001) developed the Online Anatomy Lab for first year pharmacy students. They developed and implemented a self-regulated, instructor-guided module to facilitate learning in the human anatomy laboratory. Performance and participation on the OAL quizzes is significantly and positively related to performance in the Anatomy and Physiology course. This study provides fairly strong empirical evidence of the effectiveness of the OAL educational experience.

Kadhiravan and Suresh (2001) found out whether the three different instructional strategies (viz. Lecture Method, Computer Assisted Instruction as Individualized Instructional Strategy and Computer Assisted Instruction (CAI) with Peer Interaction) are helpful in enhancing the use of Self-Regulated Learning Strategies among the students. The results of the study revealed that CAIPI and CAI strategies are more effective in
enhancing the students’ use of higher order learning strategies than the lecture method.

Liu and Hsiao (2001) examined the impact of a cognitive apprenticeship-style learner-as-multimedia-designer environment on middle school students’ cognitive skills development. The findings showed that engaging students’ as-multimedia-designers could increase their understanding of the importance of the cognitive skills involved.

Ramabai, Adinarayana and Anandavalli Mahadevan (2001) found that the teaching learning packages (experimental method) for the XII students are more effective than the traditional method in learning science concepts relating to biotechnology.

Youngblut, Christine (2001) used multimedia technology based Virtual frog dissection to provide solutions to existing curriculum problems. Multimedia-based virtual dissection was more effective than hands-on dissection in helping precollege students learn about frog anatomy. Students using the virtual program achieved this result in 44% less time than their peers who used animal dissection.

Balasubramanian and Meera (2002) studied the relative effectiveness of different modes of computer-based instruction in teaching biology. The results of the study revealed that CAI in Drill & Practice mode is more effective when compared to the CAI in Simulation mode.
Bukowski, Elaine (2002) studied “Assessment outcomes: Computerized Instruction in a Human Anatomy Course”. The results of this study suggest that computerized self-study techniques may be a viable alternative to traditional cadaver laboratory and instruction in human gross anatomy courses.

Buzzell, Chamberlain and Pintauro (2002) examined the effectiveness of a series of web-based, multimedia tutorials on teaching methods of human body composition analysis. The results indicated that web-based tutorials are as effective as the traditional lecture format for teaching these topics.

Chang, Chun-Yen (2002) explored the effects of teacher-centered vs. student-centered multimedia computer-assisted instruction (CAI) on the science achievements of tenth-grade students. The results of the study revealed that the teacher-centered teaching approach was more effective in promoting students' science achievements than was the student-centered method - especially on the knowledge and application levels of the cognitive domain.

Howerton et al. (2002) investigated the influence of Computer Assisted Instruction on Acquiring early skills in intraoral radiography. A pre and post test was used to determine student performance and instructional preference. There was no significant difference between pre and post test outcomes, indicating that similar learning took place using the interactive CD and/or lecture format. However, students preferred CAI to lecture format.
Huppert, Michal Lomask and Lazarowitz (2002) investigated the computer simulation’s impact on students’ academic achievement and on their mastery of Science process skills in relation to their cognitive stages in microbiology. The results indicated that the experimental group achieved significantly higher academic achievement than control group. Students’ academic achievement may indicate the potential impact a computer simulation program can have, enabling students with low reasoning abilities to cope successfully with learning concepts and principles in science which require high cognitive skills.

KekkonenMoneta and Moneta (2002) evaluated the effectiveness of web-based highly interactive and multimedia-rich e-learning materials by comparing students’ learning outcomes in the lecture and online versions of an introductory computing course. The result indicated that the use of carefully designed interactive e-learning modules fosters higher-order learning outcomes.

Mahoney et al. (2002) developed and evaluated the effectiveness of a CD-ROM–based multimedia program as a tool to increase users’ knowledge about the differences between ‘normal’ forgetfulness and more serious memory loss associated with Alzheimer’s disease. This result revealed that multimedia CD-ROM technology program provides an efficient and effective means of teaching older adults about memory loss and ways to distinguish benign from serious memory loss.
Rezaei and Katz (2002) conducted a study on “using computer assisted instruction to compare the inventive model and the Radical constructivist Approach to Teaching physics”. The quantitative results showed the superiority of the inventive model over the models in conceptual learning and the superiority of conventional instruction in learning the basic knowledge.

Rudat, Clarence (2002) compared the effect of web-based computer simulation activities to traditional text methods in preparing inquiry-based laboratory activities in high school biology classes. Subjects were assigned to either web-enhanced instruction or a text-based handout with the same information. This study showed that there was an eight percent higher increase in post-test scores of the web-based group when comparing the other methods.

Segers and Verhoeven (2002) studied on “Multimedia support of early literacy learning”. They developed a child-friendly computer software program to enhance the early literacy skills of kindergarteners in the Netherlands. The results revealed that kindergarteners trained using the story and the vocabulary parts of the program are also reported. After a short amount of training, the vocabulary of the children was found to show significant gains.

Selvi (2002) investigated the effectiveness of CAELL (Computer Assisted English Language Learning) at High School level. The study indicated that the computer assisted instruction has been effective among
all sections of pupils. It was also concluded that computer assisted instruction was more effective than traditional teaching methods.

**Wiksten, Spanjer and LaMaster (2002)** examined the effectiveness of using a CD-ROM (Multimedia Technology), in an introductory athletic training laboratory class as a supplement to traditional lecture instruction. Attitudes towards the computer-assisted instruction and usefulness of the CD-ROM program were also examined. The results of the study indicated that, although no significant difference was found between groups, given the correct application, computer-assisted instruction may have a place in athletic training education. Student attitudes toward the CD-ROM program were favorable.

**Aly et al. (2003)** developed and evaluated an interactive multimedia courseware package in orthodontics and to provide dental undergraduate and postgraduate students with an interactive means of self-study and self-evaluation. The result indicated that the majority of undergraduate and postgraduate students in this study were very enthusiastic about this form of educational approach because it was experienced as very helpful in understanding the orthodontic curriculum more efficiently.

**Annaraja and Jenitha Rani (2003)** developed and validated the Visual Basic based CAI package on the topic “Joint Stock Company” for XI standard and studied the effectiveness of the Visual Basic based computer Assisted Instruction in teaching Commerce for the students of XI. The ‘t’ test result showed that the experimental group was better than the control group.
Dawson, Skinner and Zeitlin (2003) compared the learning outcomes of students who had a traditional human anatomy and physiology laboratory experience with those who had, in addition to the traditional approach, a multimedia instruction. The results of the study revealed that there was no significant difference between the experimental and control group.

Kukreti and Rajesh Nagarkoti (2003) compared the effectiveness of CAI method and the traditional method of teaching on the basis of achievement of the students in Economics. The analysis of data clearly indicated that the students of the experimental group (taught through CAI method) had scored higher mean scores than the students of the control group (taught through traditional lecture).

Lafuze, Joan Esterline (2003) studied on “Engaging Students in Learning Human Anatomy and Physiology through an Interactive Multimedia Program”. The study indicated that students benefit by having the course offered closer to home (in the case of interactive video) and by being more actively engaged in the material in an asynchronous format (online).

Macaulay, Michael (2003) investigated the effectiveness of multimedia on the learning performance of non-English-speaking third world children. The performance scores of two groups of 18 children were recorded immediately before and after using either multimedia or no multimedia to learn mathematics. The children who used multimedia scored significantly higher than those who did not.
Powell, Aeby and Carpenter-Aeby (2003) studied the effects on achievement of computer based instruction as compared to instruction without the computer-based instruction. They found that an improvement in the subjects’ academic achievement was found by the use of computer-based instruction.

Rosenberg, Grad and Matear (2003) did a study on computer-aided learning (CAL), self-instructional programs that provide an accessible, interactive, and flexible way of presenting curriculum material. The study revealed that CAL was as effective as other methods of teaching and could be used as an adjunct to traditional education or as a means of self-instruction.

Shanthi and Amalraj (2003) studied the effectiveness of CAL on achievement in Bio-Zoology among the experimental and control group students with reference to different mental abilities such as Gifted, Average and Slow learners. The results indicated that significant difference was observed when the pre-test scores were compared to the post-test scores of the control and experimental groups separately. It revealed that the experimental group’s achievement score was significantly high. This shows that CAL has made significant favourable effect on achievement in Bio-Zoology.

Vasanthi and Hema (2003) studied the effectiveness of teaching Chemistry through Computer Assisted Instruction (CAI) over the Traditional Teaching Method for I-year B.E. students. The results showed
that teaching Chemistry through CAI was found to be more effective than teaching through the traditional method.

**Watts and Lloyd (2003)** investigated the classroom interventions using a particular form of multimedia ICT, and looked to study gains in pupil learning that accrue from its use. The result revealed that children can become self-directive and very active-exploratory-learners in a very short period of time. They quickly enjoy the freedom and control that the system permits and through which they can be shown to enhance particular literacy skills.

**Ambedkar (2004)** conducted a study on “Effectiveness of computer Assisted English Language Learning at High School Level”. This study reveals that there is a significant difference in the achievement of the IX Standard pupils in grammar among all the three treatment groups namely, computer, computer with teacher support and conventional. Among the three treatment groups the computer with teacher support group has the most significant effect on the pupils’ achievement in grammar. In any of the three treatments, boys and girls do not differ significantly in their achievement in grammar.

**Ardac, Dilek and Akaygun, Sevil (2004)** studied the effectiveness of multimedia-based instruction that emphasizes molecular representations on students' understanding of chemical change. Students who received multimedia-based instruction that emphasized the molecular state of chemicals outperformed students from the regular instruction group in
terms of the resulting test scores and the ease with which they could represent matter at the molecular level.

**Chang, Chun-Yen (2004)** developed a multimedia computer-aided tutorial (MCAT) on the topic of debris-flow hazards for senior high school students in Taiwan. The whole class presentation was presented through combining the usage of a laptop computer and a high-resolution LCD projector to display the MCAT contents on a large white screen in front of a whole class. The results indicated that the MCAT accompanied by the current ‘interactive whole class teaching’ form could significantly help students’ grasp of earth science concepts and greatly improve their attitudes toward earth science.

**Haseen Taj (2004)** developed a multimedia package such as audio tapes, computers, etc. to enhance the performance and self-confidence of slow learners and compared the effectiveness of the activity method and multi-media package over Traditional Teaching Method (TTM). The results of the study indicated that the activity methodology and multi-media package is more effective than the traditional teaching method, because the innovative activity methods and multi-media package helped the slow learners to perform on par with the normal learners. The method adopted by the researcher can enhance the performance of slow learners.

**Kiboss, Ndirangu and Wekesa (2004)** designed and used computer technology innovation called the computer-mediated simulations (CMS) program to enhance pupils' learning outcomes in school biology. The findings of the study affirmed the impact of the CMS program on the
pupils' learning outcomes in that the mean gains of the participants in the treatment groups were significantly higher than that of their counterparts in the regular program.

**Koroghlanian and Klein (2004)** investigated the effects of audio animation, and spatial ability in a multimedia computer program for high school biology. Participants completed a multimedia program that presented content via text or audio with lean text. The study examined the effects of instructional mode (text vs. audio), illustration mode (static illustration vs. animation) and spatial ability (low vs. high) on practice and posttest achievement, attitude and time. Results indicated that spatial ability was significantly related to practice achievement and attitude. Participants with high spatial ability performed better on the practice items than those with low spatial ability. Participants with low spatial ability responded more positively than those with high spatial ability to attitude items concerning concentration, interest and amount of invested mental effort. Findings also revealed that participants who received animation spent significantly more time on the program than those who received static illustrations.

**Kurihara et al. (2004)** compared the effectiveness of computer-based and text book-based self-instruction on the academic ability of the students. This analysis suggested that the effectiveness of CAI might be associated with the academic ability of students.
Latha Isabel (2004) developed a Multimedia web based digital learning technology courseware for teaching ‘plant taxonomy’ for B. Sc., plant biology and plant biotechnology learners at graduate level. The results indicated that the Multimedia Web Based Digital Learning Technology Courseware proves to be effective and valid in teaching biological concepts at graduate level as evidenced by judgment and empirical analysis. The experimental group shows favorable attitude towards Multimedia Web Based Digital Learning Technology Courseware.

LeDuff, Rhonda (2004) studied the use of the internet, interactive whiteboards, and computer software to improve the quality of learning in a biology classroom. In conclusion, the incorporation of IT into the biology classroom can be accomplished by approaching variety avenues. The complexity of the biology topics introduced can be overcome by connecting the biological principles to the students’ “real-world” experiences.

Maag (2004) studied the effectiveness of an online interactive multimedia-learning tool versus text only, text and images, and multimedia learning explanations on math achievement, math self-efficacy, and student satisfaction. This study indicated that compared to students in the control groups, students in the interactive multimedia group demonstrated equal posttest and retest knowledge of math; their math self-efficacy scores were also the same. Interactive multimedia group students were more satisfied with the method of learning, reported the technique to be enjoyable and more interesting, and provided sufficient feedback.
McAndrews et al. (2004) developed a Computer Interactive Multimedia Program for Learning Enhancement (CIMP LE) to enhance student learning in an introductory agronomy course at Iowa State University. The result indicated that students liked CIMP LE, found the program easy to use and that CIMP LE helped them learn course material. CIMP LE was successfully incorporated into the traditional methods on campus course, was used to create a distance version of the course and considered a valuable tool for learning to both resident and distance students.

Natarajan and Natesan (2004) conducted a study with the aim of experimenting a quality educational Video Programmes relevant to environmental science subjects and found out how to enrich the learning experiences. The study revealed that the supremacy of the video programme’s approach over the conventional method.

Ranade, Mridula (2004) prepared a Computer Assisted Instructional CAI package on “Multiple Intelligence’ and studied the effectiveness of the package in terms of achievement. In the analysis of data, the ‘t’ test indicated that there is a significant increase in the achievement in the post-test than in the pre-test. The result indicated that the CAI package was effective in bringing about learning and in evoking positive reactions towards use of CAI in teaching –learning.

Stith, Bradley (2004) studied the use of the digital animation in teaching cell biology. The results indicate that lectures using animation lead to more complete understanding of certain cell biology concepts than
lectures that use only static illustrations. The use of animation and simulation will have an increasing impact on teaching.

Tabassum, Rabia (2004) designed and studied the effect of CAI on the secondary school students’ achievement in science. The overall results of the study indicate that CAI, improved students’ achievement in the subject of biology at secondary level with higher achievement gains for the groups of high achievers.

Tse-Kian Neo (Ken) and Mai Neo (2004) observed that the multimedia educational design process will reinforce and strengthen the traditional instructional communication process and foster a number of innovative methods to communicate knowledge to the learners.

Tseng (2004) used multimedia advance organizers to promoted pupils' learning retention. The study indicated that the learning retention of the students who used computerized advance organizers was better than those of students who used none.

Annaraja and Nirmala Sundararaj (2005) developed and investigated the effectiveness of Power Point presentation in teaching zoology for higher secondary students. The results indicated that the Power Point presentation is effective in teaching zoology for higher secondary students. Further, the use of Power Point presentation has improved the knowledge, understanding and skill levels of the students. This may be due to the fact that the animation effect of the slides motivated the students in
learning. Further the effect of the colour of the slides draws the attention of the learners in learning.

**Arulsamy and Sivakumar (2005)** developed and investigated the effect of an interactive multimedia CD based learning courseware for learning zoological concepts at Higher Secondary Level. The supremacy of the interactive multimedia CD-based learning was established over the traditional method of instruction.

**Glang et al. (2005)** studied “an interactive multimedia program that teaches young children safe pedestrian skills”. The result revealed that significant effects were found on the computer-delivered and behavioral measures. Children can learn to discriminate dangerous elements in traffic situations using the Interactive multimedia program and transfer that knowledge to real-life environments.

**Helen Joy and Shaiju (2005)** developed and examined the effectiveness of the Computer Assisted Teaching on the topic, UNO in History at the higher secondary level. The results indicated that there was no significant difference between the control and the experimental (CAT) group in the mean pre-test achievement score and the mean post-test scores of the CAT group which was found to significantly higher than that of Lecture Method group.

**Lei et al. (2005)** designed and used computer-assisted instruction (CAI) in health science subjects that require visual learning. This study revealed that students who used CAI programs scored significantly higher
on the final examination than those who did not. It was suggested that a well-designed and appropriately used CAI tool may help students achieve not only learning efficiency, but also better learning outcome.

**Lim, Burt and Rutter (2005)** constructed and used virtual-reality model of three-dimensional animation for teaching iterscalene brachial plexus block. The aim is to accelerate learning and aid retention of relevant information. The result indicated that three-dimensional animation is a promising new tool to accelerate the learning of regional anaesthetic techniques.

**Mautone, DuPaul and Jitendra (2005)** examined the effects of CAI on the mathematics performance and classroom behaviours of children with ADHD. Students and teachers consider CAI to be an acceptable intervention for some students with ADHD who are having difficulty with mathematics.

**McClellan et al. (2005)** developed and studied the impact of Molecular and Cellular Biology Animations on Student Learning. An in-class research experiment demonstrated that student retention of content material was significantly better when students received a lecture coupled with the animations and then used the animation as an individual study activity.

**Oh, Pok-Ja et al. (2005)** studied the effectiveness of web-based multimedia contents for a course of physical examination and health assessment on learning achievement. The students in the experimental
group received lectures using web-based multimedia contents and the students in the control group received regular lectures. The results indicated that the mean score of the degree of educational achievement in the experimental group was significantly higher than in the control group. It was concluded that these web-based multimedia contents were found to maximize the effectiveness of the teaching process when used as a teaching aid.

Prinz, Bolz and Findl (2005) examined the effect of 3D animations on the understanding of cataract and glaucoma surgery among medical students. Students in the 3D group found the interactive multimedia teaching methods to be a valuable supplement to the conventional surgical videos. The 3D group outperformed the control group. The use of 3D animations leads to a better understanding of difficult surgical topics among medical students, especially for female users.

Rajshree Vaishnav and Parashar (2005) developed CAI in Biology on topic “Food Nutrition and Health” and studied its effectiveness in terms of achievements of students and compared the mean achievement scores of the students studying through CAI and traditional method by considering intelligence as covariate. The findings of the study showed that the computer aided instructional material was found to be effective in terms of the achievement of the students and the CAI materials are found to be superior to the traditional method when intelligence was taken as covariate.
Razavi, Seyyed (2005) investigated the effect of two learning strategies through educational multimedia. Experimental comparison between inductive and deductive in science concept learning and retention indicated that there is no meaningful difference in concept learning through educational multimedia but meaningful difference in concept retention.

Siskos et al. (2005) investigated the effects of multimedia computer-assisted instruction (MCAI) on academic achievement in physical education of Greek primary students. The result indicated that this new educational tool is an effective way to introduce health-related physical education programs for young students in typical classroom settings.

Slocum, Ann and Beard, Carol (2005) developed and evaluated CAI module to teach an advanced apparel construction technique. The results showed that CAI was as effective as traditional instruction.

Su, King-Dow and Lee, Ming-Quey (2005) investigated the effectiveness of integrating multimedia technology into mathematical teaching and to focus on students’ conceptual understanding and scientific application in the experimental group. It was found that this study created a significant positive contribution towards students’ learning in, and understanding of, mathematics. Generally speaking, it was found in this study that only by incorporating multimedia technology into mathematics teaching can students’ learning abilities be enhanced and their performance in multimedia technology be upgraded.
**Susskind, Joshua (2005)** examined the effects of non-interactive computer assisted instruction on student’s performance, self-efficacy, motivation and attitudes. Half the lectures presented in a traditional lecture format and half were accompanied by Power Point multimedia. The results indicated that lecture style did not affect academic performance, and the students who used Power Point had more positive attitudes about the course and greater self-efficacy. In the class that started with PowerPoint lectures, student motivation declined after PowerPoint stopped accompanying lectures. However, student motivation did not increase after PowerPoint was added in the other class.

**Zhang, Dongsong (2005)** examined the effectiveness of interactive e-learning. Students in a fully interactive multimedia-based e-learning environment achieved better performance and higher levels of satisfaction than those in a traditional classroom and those in a less interactive e-learning environment.

**Cepni, Tas and Kose (2006)** investigated the effects of a computer-assisted instruction material (CAIM) related to ‘photosynthesis” topic on student cognitive development, misconceptions and attitudes. The result indicated that using CAIM in teaching photosynthesis topic was very effective for students to reach comprehension and application levels of cognitive domain.
**Diseko and Van Der Westhuizen (2006)** designed and developed multimedia learning materials for the nursing science students. The result showed that the students had an overwhelming positive experience of the multimedia learning environment.

**Fuchs et al. (2006)** examined the effects of CAI to enhance number combination skill among children with concurrent risk for mathematics disability and reading disability. The results indicated that mathematics CAI was effective in promoting addition but not subtraction number combination skills.

**Guan, Ying-Hua (2006)** investigated the effects of multimedia presentations (MPs) on learning efficiency and information-processing strategy in the context of a learning scenario in which subjects were asked to learn multimedia-based instructions concerned with an assembly task. A 2 (text mode: written/spoken) by 2 (picture mode: static/moving) factorial design was employed. The results showed that spoken texts had a positive effect on learning efficiency. However, this effect seemed to be limited to moving-picture conditions. Moreover, picture mode did not exert an effect on learning efficiency, which indicated that moving pictures were not superior to static pictures in demonstrating the assembly procedures. Nevertheless, information conveyed by moving pictures appeared to be easier understood and remembered when it contained complex actions that could not be clearly depicted by static pictures.

**Ismail and Yong (2006)** investigated the effect of Information and Communication Technology (ICT) on students’ achievement in biology. A
biology topic on the Human Digestive System was chosen for the study and it was taught to two groups of students using ICT and traditional methods of teaching for four weeks. The results indicated that both methods of teaching significantly improved student’s achievement and their confidence level between students who were taught using ICT and those taught using the traditional method.

Macaulay and Pantazi (2006) investigated the relationship between varying levels of material difficulty and learning performance during the use of multimedia for learning. Findings revealed that the effect of the varying levels of difficulty of learning materials on learning performance was similar irrespective of whether or not multimedia was used, in which case, learning performance tended to decrease as level of difficulty increased. In addition, multimedia is found to be only more beneficial to learning performance than other learning material delivery modes when materials are very difficult.

Nicholson et al. (2006) examined the effectiveness of a computer-generated 3D model in learning middle and inner ear among medical students. The result indicated that the intervention group’s mean score on the quiz was 83%, while that of the control group was 65%. This difference in means was highly significant.

Ochaya, Willy Benson (2006) used 3D graphic and animation software to enhance learning experience in GED (General Educational Developmental) Math. The study indicated that students who used 3D graphics and animation performed better and more inclined to learn via the
use of interactive visual features. The combination of 3D graphics experience, the participatory approach, animation, interactivity, along with the self determination of the respondent, seemed to enhance the student’s ability to learn.

Ranade, Mridula (2006) developed CAI Presentations for Science Teaching. The research suggested that information and communication technologies (ICT) used in the form of computer assisted instruction (CAI) may benefit student learning. The results indicated that CAI has led to enhanced learning for a variety of science topics in this educational setting.

Thatcher, Jack (2006) conducted an investigation to compare the efficacy of one representative computer animation to present concepts in molecular and cellular biology with that of traditional textbook material. The results indicated that the students who used computer animations scored better than those who used the textbook. After the study, a majority of subjects indicated a preference for animation over the text. It was concluded that CAI can be an effective tool for relating basic science to medical students by improving comprehension and eliciting interest in the lessons.

Tsou, Wenli et al. (2006) developed a multimedia Storytelling Website in foreign language learning. The website contains an accounts administration module, multimedia story composing module, and story re-playing module. The results of the study support the significance and the education value of the multimedia Storytelling Website on EFL teaching and learning. If such a Website can be used within elementary EFL
classrooms, the quality of teaching and learning can be improved and students’ enjoyment and success in EFL learning may increase.

Weiss, Kramarski and Talis (2006) investigated the effects of learning mathematics with multimedia embedded in different styles of learning (cooperative learning versus individual learning) in kindergarten on students' mathematical achievements, and also examined students' preference for style of learning with computers in kindergarten. One group was exposed to multimedia embedded in cooperative learning (CL), the second group was exposed to multimedia embedded in individual learning (IL) and the control group (C) was not exposed to multimedia. Findings indicated that the CL and IL students significantly outperformed the C group in mathematical achievement. The IL students further improved their mathematical skills at the higher level, while the CL students further increased their positive attitude about cooperative learning. Theoretical and practical implications are discussed.

Brenton et al. (2007) used multimedia and web3D to teach anatomy to undergraduate medical students and discussed the educational advantages and disadvantages of using three-dimensional computer models. The delivery method was the WebSET framework, a collaborative environment that allows a teacher to manipulate 3D models over the Web in real time whilst providing explanation and help to students. In this way the courseware can be used for both self-directed study and ‘virtual anatomy demonstrations’ within an online peer group.
Chen, Chiu-Jung and Liu, Pei-Lin (2007) evaluated the effects of a personalized computer assisted mathematics problem-solving program on the performance and attitude of Taiwanese fourth grade students. The results of the study showed that the personalized computer assisted mathematics problem-solving program on mathematics improved student performance and attitude.

Kalet et al. (2007) developed the multimedia teaching modules called ‘Web Initiative for Surgical Education (WISE-MD)’ to enhance exposure to surgical disease and clinical reasoning. The results of the study indicated that compared to students who did not view the modules, early data show a trend toward improved knowledge and an improvement in clinical reasoning for students who used the WISE-MD modules. Most students felt the module was superior to traditional teaching methods and enhanced their understanding of surgical technique and anatomy.

Kamsin, Amirrudin (2007) created a Integrated 3D Multimedia Web Based Learning tool in Biology in order to provide users with a 3D element multimedia study environment in Biology subject. 3D interactions with multimedia elements relatively allow the learners to learn and grasp the lessons being taught much faster than in a normal classroom.

Liao, Yuen-kuang and Chen, Yu-wen (2007) studied the effects of computer simulation instruction (CSI) versus traditional instruction (TI) on students’ achievement in Taiwan. The results of this study suggest that CSI clearly has a more positive effect on students’ learning than TI.
Mi Jie (2007) conducted a study on “An application multimedia to the teaching of machine design”. Multimedia teaching employs modern learning theory and adopts engineering system method to optimize teaching process and achieve favorable effect. An optimal course system is introduced by using multimedia technology stimulates learners to study with discovery, association, leap and creativity.

Nimavathi and Gnanadevan (2007) studied the impact of computer multimedia programme in teaching science at the secondary level. The students of the experimental group scored better in their achievement and showed favourable attitude towards science than the students of the control group, after experimentation. The results of this study revealed that multimedia has an impact in teaching science to ninth standard students and also in their attitude towards science and attitude towards computer.

O’Day, Danton (2007) studied the effectiveness of animations versus graphics in the long-term retention of information in learning biology. In this study, involving 393 student responses, three different animations and two graphics were used to determine the long-term retention of information. The results indicated that animations lead to greater long-term memory retention than simple graphics.

Pereira et al. (2007) implemented innovative teaching methods - blended learning strategies (Simulation and e-learning) - that include the use of new information technologies in the teaching of human anatomy and analyzed both the impact of these strategies on academic performance, and the degree of user satisfaction. The study revealed that blended learning
was more effective than traditional teaching for teaching human anatomy. Student attitudes toward the CD-ROM program were favourable.

Victoria, Roldan and Roldan (2007) conducted a study on “Multimedia and Virtual Reality Application for Teaching-Learning Human Senses and Therapy of Lateral and Space Location”. A computer-tool was created based on non-immersive virtual environments that can run online or without an Internet connection. This software pretends to be an assistant tool in the teaching-learning process. This research suggests that virtual reality, multimedia and Piaget's method helps the teaching-learning process and therapy of lateral and space location of their body.

Chang, Kuo-En et al. (2008) studied the effects of learning support in simulation-based physics learning. The results of the study revealed that the outcome for learning about the basic characteristics of an optical lens was significantly better for simulation-based learning than for laboratory learning.

Djeassilane (2008) investigated the effect of computer aided instruction (CAI) in enhancing the academic achievement of higher secondary students in commerce. The findings of the study showed that the computer aided instruction was effective in helping the students of the experimental group to perform better in the post-test. It proved the effectiveness of the computer aided instruction in commerce developed by the investigator. And also it was found that the experimental students had more favourable attitude towards computer assisted instruction.
Garnett, Hackling and Oliver (2008) developed an interactive multimedia package to improve students’ understanding of the particulate basis of chemical reaction, and their ability to interpret chemical equations and solve problems based on equations. The study showed that Interactive multimedia provided learners with access to a rich information source and appropriate activities to promote learning and understanding.

Junaidu, Sahalu (2008) studied effectiveness of multimedia in learning & teaching data structures online. This paper explores and reports on the importance of creating multimedia-rich course content and the important role that animations can play in creating a successful online learning experience. Results indicated that students consistently perform much better in questions requiring application of material taught in carefully animated algorithms. These results should carry over to other educational environments.

Liao, Yuen-kuang C., Chang, Huei-wen and Chen, Yu-wen (2008) compared the effects of computer applications (i.e., computer-assisted instruction, computer simulations, and Web-based learning) versus traditional instruction on elementary school students' achievement in Taiwan. The results suggest that computer application instruction is more effective than traditional instruction for elementary school students in Taiwan.

O’Day, Danton (2008) studied on “using animations to teach biology: past & future research on the attributes that underlie pedagogically sound animations”. Multiple technical resources (commonly referred to as
multimedia) are currently used by many instructors to communicate difficult topics and concepts to their students in meaningful ways. Various sources have shown that animations are more effective than static sequential images. This study evaluated how animations can be and have been used as effective teaching and learning tools in biology and what more needs to be done to understand their true value.

**Ozmen, Haluk (2008)** studied on “The influence of CAI on students’ conceptual understanding of chemical Bonding and attitude towards chemistry: A case for Turkey”. The results of this study suggested that teaching-learning of topics in chemistry related to chemical bonding can be improved by the use of computer-assisted teaching materials.

**Ponraj and Nellaiyapen (2008)** investigated the effectiveness of CAI in teaching Zoology. The major finding of the study showed that the experimental group performed better than the Control group in the post-test. The results of the study revealed that experimental method of teaching is more effective than the traditional method of teaching the topic ‘Nucleus’ in Zoology.

**Pryor, Caroline and Bitter, Gary (2008)** used multimedia to teach in-service teachers and studied its impacts on learning, application, and retention. The study found that the video modeling in the module was effective in helping teachers learn, and discourse strategies were learned, applied, and retained.
Rotbain, Marbach-Ad and Stavy (2008) used a computer animation to teach high school molecular biology. The achievements of the experimental group were compared with those of a control group. Analysis of the post-test showed that the mean score of the experimental group was significantly higher than the mean score of the control group.

Venkataraman (2008) prepared software packages (CAI) for XI standard physics and studied the effectiveness of it’s among selected modes of CAI in physics in relation to learners’ personality. The results of the study showed that the CAI is effective with different modes. Computer Assisted Instruction shows significant difference in the achievement of different instructional objectives. Further Computer Assisted Instruction enhances the retention of the learnt content.

Vernadakis et al. (2008) examined the effect of multimedia computer-assisted instruction (MCAI), traditional instruction (TI), and combined instruction (CI) methods on learning the skill of shooting in basketball. Additionally, a comparison of the students’ attitudes towards the MCAI and TI methods was made. Students took pre-, post-, and retention written test covering techniques and rules of the games. Post-test results indicated no significant differences between the groups concerning the written test. Nevertheless, the attitude test scores of the CI group were more favourable to MCAI method than the TI method. Retention test results showed that groups retained the knowledge acquisition. However, the combined method of instruction tended to be the most effective for cognitive learning.
Victor, Adeosun Olufemi (2008) investigated the relative effects of three multi-media instructional packages on Nigerian students’ achievement in social studies. The purpose was to determine which of the combinations of videotape recording presentation, pictures and the chalk and talk method; the combination of audiotape recording presentation, pictures and the chalk and talk method and the combination of pictures and the chalk and talk method. The study revealed that the combination of pictures and the chalk and talk method was most effective among the packages tested in the learning of social studies.

Dalacosta et al. (2009) developed and studied the effectiveness of Multimedia application with animated cartoons in teaching science in elementary education. The results of the study provide evidence that the use of animated cartoons significantly increases the young students' knowledge and understanding of specific science concepts, which are normally difficult to comprehend and often cause misconceptions to them.

Jian Hu et al. (2009) investigated the effects of introducing a software program, named the Dental 3D Multimedia System (D3DM), into the education of a group of junior dental students in their preclinical practice. One group received their training program in the traditional way, unassisted by 3D technology. The second group received their training program in the traditional manner, but also used the D3DM to supplement their education. The results showed that the D3DM-assisted group achieved higher scores and also indicated that the usage of 3D multimedia PC software had a positive impact on several aspects of subjects’ performance.
Kanmani and Radha (2009) studied the Effectiveness of CAI package in basic electronics teaching. There was a significant difference between the control and the experimental group students in attainment of knowledge level, understanding level, and application level objective in the gain scores. Hence, the experimental group students were better than the control group students in attainment of knowledge level, understanding level, and application level objective in the gain scores. It was inferred from the finding that the experimental treatment is effective to the students.

Korakakis et al. (2009) made a study on the “3D visualization types in multimedia applications for science learning for 8th grade students in Greece”. The aim of the study was to determine whether the use of specific types of visualization (3D illustration, 3D animation, and interactive 3D animation) combined with narration and text, contributes to the learning process in science courses. The results indicated that multimedia applications with interactive 3D animations as well as with 3D animations do in fact increase the interest of students and make the material more appealing to them.

She, Hsiao-Ching and Chen, Yi-Zen (2009) examined how middle school students constructed their understanding of the mitosis and meiosis processes at a molecular level through multimedia learning materials presented in different interaction and sensory modality modes. The dependent variables included subjects’ pre-test, post-test, and retention-test scores, showing their understanding of mitosis and meiosis process at molecular level. The results of the study showed that the group which used multimedia learning material has a greater amount of visual attention and
consistent with their long term retained learning than the group which did not use the same. This study adds empirical evidence of a direct correlation between the length of eye fixation behavior and the depth of learning. Moreover, it provides insight into the multimedia effect on students’ cognitive process through the use of eye fixation behavior evidence.

**Anboucarassy (2010)** studied the effectiveness of Multimedia in Teaching Biological Science to IX Standard students. The results of the study revealed that experiment group performed better than the control group due to the exposure of multimedia based learning. Thus multimedia helps the students to sustain their interest and also their retention power compared to the traditional method of teaching. The constant use of multimedia will make students understand more and achieve more in their academic achievement. Hence it was concluded that the multimedia approach is considered to be one of the best techniques for biology teaching at IX standard level.

**Ponraj and Sivakumar (2010)** studied the effectiveness of Computer-Assisted Instruction in Teaching Zoology in Relation to Learners’ Personality. The major findings of the study indicated that achievement scores of experimental group students were higher than the control group students after the treatment.

**Yusuf, Mudasiru and Afolabi, Adedeji (2010)** investigated the effects of computer assisted instruction (CAI) on secondary school students’ performance in biology. The findings of the study showed that the performance of students exposed to CAI either individually or
cooperatively were better than their counterparts exposed to the conventional classroom instruction. Based on the research findings recommendations were made on the need to develop relevant CAI packages for teaching biology in Nigerian secondary schools.

2.3 CONCLUSION

It is very much important to have the summary of the findings of the previous studies by the investigator as it helps him to formulate objectives and hypotheses and design the research process. In this chapter, related literatures are reviewed extensively.

The review of literature provides a clear picture about the present status of importance of computers in education, computer assisted instruction and multimedia programme in teaching. From the findings of the recent researches on the students’ performance, the need for effective teaching was felt. Hence it was understood that very few studies have been conducted to see the effect of multimedia programme on the students’ performance. The very little studies have been concentrated on how students can be motivated through multimedia programme and also concentrated on the high and low achievers.

Hence it was inferred that only a few researches have been attempted in multimedia programme in other subjects and biology in particular human anatomy and that too at the school level. The summary of related studies helps the investigator in indentifying the research gaps in the area of the study. Thus in the present study, an attempt has been made to study the
effectiveness of multimedia programme in perceiving human anatomy among higher secondary students. The investigator has formulated the objectives, hypotheses and research design based on the findings of the previous studies.

The studies conducted in India and abroad on the effectiveness of multimedia programme in biology in particular in human anatomy and other subjects are discussed in this chapter. The next chapter deals with methodology of the study.