CHAPTER-II

REVIEW OF LITERATURE
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For any research work, comparative study of the related literature is an essential and indispensable prerequisite. Existing literature in the field could be expected to help in identifying areas that have so far been explored. Review of related literature is a compulsory step preceding any scientific explanation in order to embed that the problem is solid footing i.e. validate its significance, to give direction to research procedure and to reinforce the finding of the study. Unlike other animals that must start a new with each generation, man builds upon the accumulated and recorded knowledge of the past. The very meaning of this statement by Best (1993) under lies the idea of what we call review of related literature in research study because the study of related literature implies effort on the part of researcher in locating, reading and evaluating reports of research as well as reports of casual observation and options that are related to the research project basically to build up a sound foundation of her work. According to Borg (2007), "literature in any field forms the foundation upon which all future work will be built. If we fail to build the foundation of knowledge provided by the review of literature our work is likely to be shallow and naive and will often duplicate work that has already being done better by someone else."

According to C.V. Goods(1963), "The survey of related literature may provide guiding hypothesis suggestive methods of investigation and comprehensive data for interpretive purpose."

The review of previous researches done in the past in associated areas of research is extremely important, it helps the investigator in identifying the problems, providing a background for the tools, design and what has been investigated. The related literature brings the investigator up to date. Also previous researches help to eliminate duplication and provide useful hypothesis and helpful suggestions for significant investigation. It also helps the investigator in safeguarding the work from pitfalls and weaknesses with which some of the earlier researchers may have suffered. In the words of Best (1993), "A familiarity with literature in any problem area helps the student to discover what is already known, what others have
attempted to find out, what methods to attack have been promising and disappointing and what problems remain to be solved.” Citing studies that show substantial agreement and those that seem to present conflicting conclusions help to sharpen and define the problem to be undertaken. Review of existing knowledge in the problem area provides a background for the research project and makes the investigator aware of the status of the issue. It enables the investigator to decide how far the selected problem is novel enough and does not have any chance of duplication. Thus, the review of literature suggests some area of further study. After having referred to the survey of educational research, journals, yearbooks, educational reports of the researches and the internet, the investigator felt that literature related to his study are many, although, there is no study exclusively of the same type. An attempt is being made here to present some of the studies conducted at international and at National levels. The goal of the literature review was to gather information on a wide canvas therefore, the present chapter attempts at reviewing available literatures, which the researcher thinks to be relevant with regard to the study with the objective of bringing together, the relevant data and studies.

In the present study, the investigator examined the fact of two strategies of teaching on achievement of tenth class students in Science i.e. IT-Enabled Instructional Package in Science and Traditional Method. Though a lot of work has been done on Multimedia in abroad but very few research studies have been taken up in India so far. So, the review for the present study has been done for both National and International levels. Review of research studies which has been taken up in the recent past is listed in the following pages.

**Pillay and Anandan (1990)** analyzed the educational video productions made in India. It was found that the total number of educational video productions in India in 1983 was just 17, the number increased to 285 in 1987; subjects like education, economics, management and sociology received much attention. But the subjects like political science and geography had only a very limited number of productions – four and five productions respectively.

**Idayavani (1991)** developed a Video Programme on Weathering and Work of Rivers in Physical Geography for Higher Secondary Students. The findings of the study indicated that the higher secondary students improved their learning of the
concepts on ‘weathering’ and ‘work of the rivers’ after viewing the video programme; the higher secondary students taught by the video method performed better than the students taught by the traditional lecture method.

**Jayamani (1991)** studied the effectiveness of the simulation model of teaching through Computer Assisted Instruction (CAI) in teaching physics to XI students. The findings of the study revealed that the experimental group obtained a higher mean than the control group; the sex-wise comparison proved to be insignificant and the experimental group performed significantly better than the control group.

**Kalimuthu (1991)** investigated that whether students in higher secondary schools who are taught certain concepts in biology by the video method achieve more than those who are taught by the traditional method. It was found 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 lecturer method and the higher secondary students improved their achievement on environment pollution after viewing the video programme.

**Sinnathambi (1991)** studied that whether the video method is more effective than the traditional lecture method in teaching concepts on ‘energetics’. The findings of the study indicated that the students who were taught by the video method learned more concepts on energetics than those who were taught by the lecture method and the students improved their achievement on ‘energetics’ after viewing the video programme.

**Passi & Paul (1992)** examined the effect of multimedia instructional module for developing the skill of observing classroom behaviour through Flanders Interaction Analysis Category Systems (FIACS). It was found that experimental group studying through instructional material obtained a significantly higher mean score on the criterion test than the control group; the treatment was found effective in developing classroom observation skills through the FIACS and the reactions gathered during the study indicated a favourable opinion by the trainees on all its aspects, namely, objectives, examples, contents, language, learning exercise, glossary, utility, general appearance and cartoons.

**Rose and Stella (1992)** studied the effectiveness of computer-assisted instruction with special reference to underachievers which throws light on the application of
computer-assisted instruction (CAI) and the teacher support system (TSS) for the optimum development of under achievers (UA). It was found that both the CAI strategies were superior to the traditional method of instruction and CAI with TSS was more effective than CAI without TSS for underachievers (UA) except achievement level, all the other learner variables combined with the treatment had no interaction effect on the achievement score.

Fyfe and Fyfe (1994) reported students’ positive attitude towards multimedia in their Australian study. Observation and evaluation of a multimedia-delivered Biology experiment indicated that students enjoyed using the program and demonstrated significantly higher on-task behaviours than when participating in traditional laboratory-based experiments.

Beichner (1994) established some very positive points about multimedia through two years long study. Several categories emerged out of qualitative analysis of the data which included extensive videotapes, interviews, observations and student-centered materials. The findings of the study revealed that students demonstrated great concern for accuracy in their displays, they quickly assumed the major responsibility for content and editing decisions despite the fact that the original task of designing the displays had been structured for them by the teacher, students accessed wide range of science materials and sources to find the content they desired and their commitment to and enthusiasm for the project remained very high and the bottom line was that by establishing an environment where creative thinking about content is combined with real world assignments, students learned the content, enjoyed the learning process and recognized that they created something worthwhile.

NCERT (1994) studied the impact of educational telecast and revealed that there is a direct relationship between viewing of educational telecast and the children performance. They do significantly better in mathematics, environmental sciences and language skill with audio visual representation if teachers to get involved with them. The study suggest that the success of educational telecasts depends mainly on the quality of programmes and quality of support services such as electricity, and television/computer sets with a good reception which together adds to the viewing experience.
Prabhakar (1995) developed the software for computer-aided instruction (CAI) to compare with traditional method for teaching Physics at +2 level. The findings of study explored the CAI material was found effective in terms of achievement and reaction towards CAI material of both class XI and XII students and the CAI was found to be significantly superior to traditional method in terms of achievement of class XII students when moderate variables were considered as covariates separately and it was found to be equally beneficial to both males and females of class XII in terms of achievement when moderate variables were considered as covariates separately.

Proctor and Richardson (1995) determined the overall effectiveness of multimedia computer modules as enrichment exercises for introductory human geography. It was found that an array of quantitative and qualitative evaluation methods will better serve the important objective of improving multimedia use at the university level.

Ameen (1995) conducted a study on the impact of the hypermedia on the students’ academic achievement and the attitudes toward using computer to teach the Faculty of Education students, Minya University. The study found out statistically-significant differences between the two groups concerning students’ marks on the computer attitude scale in favor of the experimental group. Moreover, it found out statistically-significant differences, in the academic achievement test, between the two groups in favor of the experimental group.

Bose (1996) studied the effectiveness of computer programmes as remedial strategies for overcoming specific learning disabilities. The findings showed that the experimental group gained more than the control group in Mathematics by five percent; the experimental group gained more than the control group in English by seven per cent and the gains made by the sub groups of the experimental group were noticeably more than those made by the control group. This was true both for Mathematics and English.

Callaway (1996) identified that effectiveness of an interactive multimedia computer package designed to accommodate a number of cognitive and learning style is much higher for learning difficult topic such as ‘photosynthesis’ for high school students than the typical classroom method.
Rangaraj (1997) established the relative effectiveness among different instructional strategies, viz., conventional lecture method, CAI as individualized lecture method, CAI as support system to teachers' classroom instruction in teaching-learning Physics at higher secondary level. The findings of the study revealed that there were significant differences between the means of pre and post test in Physics among one control and two experimental groups at all the levels of cognition in favour of the posttest and there was significant difference between the means of CAI-SS and CAI as individualized instruction and conventional lecture methods by the post-test. The mean of CAI-SS was found to be greater than the CAI as individualized instruction and conventional lecture method.

Kumar (1998) studied the relative effectiveness of three methods of Instruction – Exposition Method, Programmed Learning Method, and Multimedia Method in Science. The Findings of the investigation revealed that the multimedia method was more effective than either the programmed learning method or the expository method; the programmed learning method was more effective than the expository method and there was no interaction between the three methods of instruction and the levels of intelligence.

Das (1998) explored the effectiveness of computer-assisted learning material on Rhymes in different modes viz. in terms of word meaning (lexicon), analytical understanding, comprehensive understanding, writing ability, recitation ability and LSRW ability. The major findings of the study showed that the composite modes of presentation may not ensure higher cognitive language learning; intelligibility of a message is a function of sender, message, medium, mode, receiver, and the environment.

Nalayini (1998) developed and validated the computer-assisted instruction in Physics for high school students to study the effect of computer-assisted instruction on learning the concepts in the topic “Electricity” in physics. The findings of the study showed that the achievement in the posttest of the experimental group is higher as compared to control group and the experimental group differs significantly when compared to control group. Hence learning through computers helped in achieving better than the control group.
**Watson, Berry & Chris (1998)** studied the use of communication technology in teacher education to explore the reality of communications between teacher trainers in the university and their co-tutor partners in schools. According to findings preliminary results indicate that identifying and getting operational suitable means of communication are fraught with difficulties. Impoverished and differential resourcing is a major inhibitor to schools going “on line”. Teacher educators, whether in universities or schools appear ICT, with a complex set of perceptions that may be at odds with reality. The staff of university computer networks fail to understand users’ needs of distributed and distance networks. But most significantly it is clear that the existing partnership relationships between trainers in college and schools is out of balance, operating in parallel rather than together, and based upon substantial misconceptions.

**Khirwadkar (1999)** studied the effectiveness of developed computer software for learning chemistry at Standard IX. The major findings of the study revealed that the developed software package was effective in terms of academic achievement of the students. The students and teachers were found to have favorable opinion towards the software package. In addition, he found an interaction effect of IQ, motivation and opinion of students on their academic achievement.

**Hajzainuddin (1999)** studied the learning styles and hypermedia’s organizational structures in a Web-based instructional programme designed for trainee teachers at the international Islamic University, Malaysia. Findings of the study revealed no significant relationship between the information-processing characteristics of learning style and performance. In addition, he found no significant interaction among the factors of learning style, hypermedia’s organizational structure and attitude.

**Kadhiravan (1999)** studied the effectiveness of Computer Assisted Instruction in relation to students’ use of Self-regulated learning strategies among the higher secondary students with different levels of cognition, viz. knowledge, understanding application. The major findings of the study revealed that among the instructional strategies viz. LM, CAI and CAIPI, CAIPI was the most effective instructional strategy in terms of realizing the instructional objectives in physics at higher secondary state and among the three instructional strategies, CAIPI is the most
effective one in terms of its effectiveness in realising the instructional objectives in the context of contents with low difficulty level.

**Zyoud (1999)** conducted a study to develop the computer-assisted English language teaching for VII standard students. The study revealed that when the computer is used to its full potential, it can help the students achieve more in learning vocabulary, grammar and comprehension to the learners with different IQ, motivation and attitude. It helps the students learn better because it provides them with a lot of freedom and responsibility to learn at their own pace. The students were found to have positive attitude towards Computer Assisted English Language instruction.

**Panda and Chaudhary (2000)** determined the degree of attainment of cognitive skills through computer assisted learning (CAL) compared to traditional approach to teaching and to compare the effect of CAL on the learning achievement of boys and girls. The major findings of the study revealed that Computer Assisted learning (CAL) resulted in greater learning achievements in all hierarchies of cognitive domain and male students was found to be superior to female students in learning physics.

**Stark, Gray and Payne (2000)** studied the impact of information and communication technology initiatives on pupils' skills and knowledge. Researchers have found that ICT improved motivations, enhanced learning and teaching, improved communication and access to information, and improved efficiency and feelings of independence. Teachers perceived ICT to be useful for streamlining current teaching procedures, gaining access to new professional opportunities and new exciting teaching opportunities.

**Yadav (2000)** studied the effectiveness of the computer software for students of standard I. There has been found a significant gain in terms of mean achievement on the software on Alphabets and Animals. Most of the students were found to have positive reactions towards the software. Teachers welcomed the media integrated approach towards learning.

**Patel (2001)** conducted a study on learning through CALM in relation to selected production variables and contiguity. Findings of the study examined the significant gain through interaction with CALM on Solar System and Magnet. The status of CALM in terms of production variables and contiguity vis-à-vis achievement has
been found quite high except on a few teaching points where there was need to improve upon graphics, mode of presentation, spatial contiguity of text and animation, and temporal contiguity of animation and narration.

Lohumi (2001) explored the quality and content of information about adult education and literacy disseminated through the media and the manner in which it was done. Findings of the study indicated that the coverage of the programme in the print media was satisfactory as compared to efforts put in by the organizers but there had been no sustained effort to motivate media persons to take initiative in this regard.

Pulist (2001) conducted a study on transition to internet-based learning in IGNOU to analyze the method and procedures adopted by IGNOU to provide support services to the Internet learners. The findings of the study revealed that the programme was directly managed and run by the School of Computer and Information Science. Other outlets (Regional Centers and Study Centers) were not involved in the programme delivery; other wings of the University were not able to give the core information pertaining to Internet programmes to the learners. However, utilization of the University network throughout the country could have helped in removing misgivings of the aspirant learners about the programme. Also the Internet Access Points empanelled by the University did not come up to the expectations of the learners and became the major source of problem generation not only for the students but for the University as well.

Ranade (2001) worked on Science teaching through CAI and concluded that thoughtfully designed CAI is indeed effective in bringing about learning, but when the teacher is really good, a few students prefer traditional face-to-face teaching to CAI. The packages when used in the self-learning/group learning mode can be a better alternative to ineffective teaching.

Balasubramanian and Meera (2002) studied the relative effectiveness of different modes of Computer – Based Instruction in teaching Biology. It was found that CAI in Drill and Practice is more effective than the Tutorial and Simulation modes in teaching Biology at Standard XI and more software packages can be developed for the whole syllabus which will help the students to learn at their own pace.
Dilek and Sevil (2002) studied the effectiveness of multimedia-based instruction that emphasizes molecular representations on students' understanding of chemical change. Findings revealed that 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. However, results relating to the long-term effects suggested that the effectiveness of a multimedia-based environment can be improved if instruction includes additional prompting that requires students to attend to the correspondence between different representations of the same phenomena.

Sharma and Sansanwal (2002) compared among video-based instructional strategies for teaching science at class IX level in terms of achievement. The findings of the study revealed that the treatment had significant effect on achievement in science of students belonging to different video-based instructional strategies for teaching science and the video viewing followed by lecture as well as video viewing followed by discussion were significantly higher than those of video viewing only. Also the mean scores of science achievement of video viewing followed by lecture was found to be significantly superior to video viewing followed by discussion.

Shinde (2002) determined the effectiveness of Multimedia CAI Package with reference to levels of interactivity and learning style. The findings of study indicated that CAI was effective in terms of achievement; CAI can also bring significant increase in the achievement scores and the interactivity plays major role in enhancing the achievement of the learners learning through CAI.

Vekaria (2002) explored the effectiveness of video instructional programme in teaching of science for class VII. Findings of the study revealed that video instructional programme was effective in the urban as well as rural areas of Saurashtra, Central Gujarat and South Gujarat; the video instructional programme was found equally effective on rural and urban areas of entire Gujarat and the effectiveness of the programme was found directly proportional to the level of achievement in all the three areas; (iv) the students and teachers were found to have positive reaction towards the video instructional programme.
Goldberg, Russell and Cook (2003) studied the effect of computers on student writing. The researchers found that the writing process was more collaborative, iterative and social in computer classrooms as compared to paper-and-pencil environments, and they concluded that pupils who use computers when learning to write were not only more engaged and motivated in their writing but also produce written work that was of greater length and higher quality.

Vasanthi and Hema (2003) studied the effectiveness of computer-assisted instruction in teaching Chemistry for I Year B.E. students. The major findings of the study showed that there is significant difference between the mean gain score of the control group taught through TTM and the experimental group administered by the CAI in all unit put together and there is significant difference between the mean scores of post-test of control group taught through TTM and experimental group administered by CAI in all units put together.

Vij (2003) compared the effectiveness of computer-assisted instruction (CAI) and computer managed instruction (CMI) on pupil’s achievement in Science, their self-concept and study involvement. The findings of the study depicted that the group of Pupils taught Science through computer-assisted instructions was effective in raising the self-concept of the pupils and the post-test mean scores of the Pupils taught Science through computer-assisted instructions increased significantly which indicates that computer-assisted instructions enhanced study involvement of the pupils.

Chang (2004) identified the role and effectiveness of e-learning and key issues related to its implementation in an industrial context. The study revealed interesting findings about differences between industrialists and academics regarding factor influencing effective and ineffective e-learning implementation. Both groups have close ideas in identifying factors influencing effective implementations but have some variations in identifying factors influencing ineffective implementations. There is a significant difference between their rationales. Industrialist’s rationale emphasizes practical applications; in contrast academics’ rationale emphasizes the literature review and research findings.

Cox, Abbott, Webb, Blakeley, Beauchamp & Rhodes (2004) conducted a study to know the relationship between ICT and attainment. The study has found positive
effects of ICT on pupils' attainment in almost all the National Curriculum subjects, particularly regarding mathematics and English at all key stages and the impact on attainment was greatest for those ICT resources that have been integrated in teachers' practices for a long time.

**Desai (2004)** carried out the study to compare the efficacy of teaching through the Traditional Method and the Multimedia Approach in the Subject of Home Science. The findings of the study showed that the mean achievement of the experimental group was significantly higher than that of the control group and the students were found to have favourable opinions towards the multimedia approach.

**Jones and Scrimshaw (2004)** identified the factors that prevent and facilitate the uptake of ICT by teachers. The study on the barriers has found that the uptake of ICT is most commonly prevented by lack of confidence, recurring technical faults, and resistance to change; the uptake of ICT is most frequently facilitated by leadership and planning, sharing of resources, technical support, and schools working with each other and with the local community.

**Jothiokani and Thiagarajan (2004)** studied the effectiveness of computer-assisted instruction in Mathematics among B.Sc. degree students. It was found that there is no significant difference between the mean scores of pretest for control groups and the experimental groups in all six units with reference to the objectives such as knowledge, Comprehension and Application and their level of achievement such as Low, Average and High Achievers and the mean scores of post-test of control group were significantly higher than that of the experimental group in all six units with reference to the objectives and their level of achievement in both the years 1999-2000 and 2001-02. It was concluded that the conventional method is more effective and efficient than CAI method.

**Joy and Shaiju (2004)** conducted a study on development of computer-assisted teaching material in History at higher secondary level and its effectiveness. The findings of the study revealed that though both the methods led effective learning, the computer assisted teaching method was found superior to that of the lecture method.
Ludwig and Daniel (2004) conducted a study to identify some of the best practices in computer-enhanced classroom instructions. The findings of the study had shown that if done well, multimedia content organized with a slide ware tool can generate productive and stimulating presentations that lead to greater retention, application to new situations, and performance on assessments. If not done well, they can be a distraction from learning and ultimately unproductive.

Macwana (2004) conducted a study on development and effectiveness of computer-assisted learning material for class IX students. The study revealed that CALM was effective in terms of achievement and reaction.

Passey, Machell, McHugh and Allaway (2004) studied the motivational effect of ICT on pupils to investigate the effects of ICT on pupils' motivation. The study has found that ICT positively impacted on motivation, particularly in relation to engagement, research, writing and editing and presentation. Pupils reported that the Internet, interactive whiteboards, writing and publishing software, and presentational software were the most useful. There was also evidence that ICT positively influenced attitudes towards school work and school behaviour.

Kiboss (2004) conducted a study on 'Effectiveness of a computer-mediated simulation program in school biology on pupils 'learning outcomes in cell theory 'and their findings revealed that the mean differences between the experimental group and the true control group were statistically significant in favour of the treatment group. The finding also showed no relationship between the participants’ gender and their learning outcomes. The study concludes that the use of the CMS programme to augment conventional biology teaching has major implication for secondary biology instruction in this area.

Tuzlukova (2004) studied cultural and social aspects of educational discourse in E-Medium and reported on some impressions of Russian English language teachers who took an e-learning course. The findings showed that the percentage of those who have not started any e-course in the last 3 years is great (74 percent). Nevertheless the dropout percent is low (4 percent). Most of those who started e-learning courses completed them (21 percent). These findings indicate that E-learning programmes have not replaced even partially traditional classroom practices in Russian universities. Most of the respondents answered that their
universities were quite new in e-learning programmes. Some started educational programmes with electronic means in 2001, others in 2003 and try to their best to organize them well.

**Keong, Horani & Daniel (2005)** found that the use of ICT in teaching mathematics can make the teaching process more effective as well as enhance the students' capabilities in understanding basic concepts. Nevertheless, implementing its use in teaching is not without problems as numerous barriers may arise. The types of barriers have been identified in the study. A proposed e-portal to overcome some of these barriers was introduced as part of the on-going research project.

**Kohli (2005)** studied the efficacy of computer-assisted, concept attainment models on students' achievement in environmental science. The findings of the study revealed that the computer-assisted model and concept attainment model were effective in improving the achievement level of students and they have changed the aptitude and interest of the students. Unlike conventional method, students got feedback and remedial teaching which automatically improved their achievement and promoted their self-concept.

**Pareek (2005)** conducted a study on Computer Curriculum in Teacher Education Program. The study revealed that teacher trainees, teacher and principals keep a positive attitude towards computer programme and different colleges of different university of Rajasthan have similar units of computer programme as their syllabus.

**Pardeshi (2005)** determined the relative effectiveness of CAI in learning trigonometry by English medium students of standard IX of Baroda City. The findings of the study revealed no significant difference in the mean achievement scores of the experimental group in mono diad, triad and control groups, respectively and significant difference has been found in the mean achievement scores of the experimental group in triad and control group.

**Singh (2005)** conducted a study on the topic 'Effectiveness of CAI for teaching Biology”. The study compared the effectiveness of CAI as compared to lecture method on the topics “Cells and Tissues”. Investigator found that i. both the methods were effective in enhancing the learning about cell and tissue. ii. While lecture method was more effective than CAI for teaching cell and CAI was more effective than lecture method for teaching tissues.
Cepni & Kose (2006) studied the effect of Computer-assisted Instruction Material related to ‘photosynthesis’ topic on student cognitive development, misconception and attitudes. The result showed that using CAIM in teaching photosynthesis topic was very effective for students to reach comprehension and application level of cognitive domain.

Kim (2006) studied the effects of 3D virtual reality of plate tectonics on fifth grade students ‘achievement and attitude towards science. An ANOVA analysis revealed that the 3D group scored significantly higher on the achievement test than the control group using traditional 2D visuals.

Jayaraman (2006) explored the relative effectiveness of computer-based multimedia learning package (CBMMLP) on performance and behavioural outcomes of students of different age groups. Major findings of the study depicted that the CBMMLP prepared specifically for the particular concepts are significantly effective for all the age group of students. There has been found a higher usage by higher age group students; the relative effectiveness of the CBMMLP is significant for all the age groups of students, who are studying Class V, Class VIII and Class XI. The performance of the students who have learned through CBMMLP is higher than the performance of the students who have not learned through CBMMLP.

Patil (2006) developed the multimedia instructional system on computer education for B.Ed. pupil-teachers and checked its effectiveness. Various findings of the study revealed that the present setting of teaching of computer education in B.Ed. colleges was found unsatisfactory and there is significant difference between the gains in achievement in terms of scores in pre-test and post-test of the pupil-teachers from pre to post-test.

Sheela and Talawar (2006) conducted a study to know attitude of teacher educators towards ICT. The major findings of the study revealed that teacher educators possessing good and poor knowledge of ICT differ in their attitude towards teaching ICT and teacher educators with good knowledge of ICT have more favourable attitude towards teaching ICT; male and female teacher educators do not differ significantly in their attitude towards teaching ICT; also teacher educators from private aided and private unaided colleges differ significantly in their attitude towards teaching ICT; teacher educators from private unaided colleges were found
to have more favourable attitude towards teaching ICT and in last a significant difference was found in the attitude of high experienced and less experienced teacher educators towards teaching ICT teacher educators with less experience had a more favourable attitude towards teaching ICT than teacher educators with more experience.

Liao (2007) studied the effects of computer-assisted instruction on students’ achievement in Taiwan. The result suggests that CAI is more effective than traditional instruction (TI). The effect of CAI in instruction are positive over TI.

Davis & Preston (2007) studied the theoretical and evaluation frameworks to re-examine the evidence from a national initiative to train all teachers in England to bring them up to the level of newly qualified teachers who are required to know when to use, and when not to use, Information and Communication Technology (ICT) in their professional practice. This first analysis showed Guskey’s levels to be robust for ICT-related teacher training, including a significant correlation between the experts’ views and those of teachers who had undergone training. The evidence confirms the value of an ecological perspective. The most effective training supports change with ICT in macro and micro ecologies, including the classroom the school, and training provider’s region. ICT-related teacher training using an ‘information transfer’ approach is not appropriate, despite its success in commercial train.

Jyothi (2007) studied the impact of computer-based learning on students of Chemistry. The study clearly revealed that that the self-instructional module prepared by a teacher through simple power point presentation could show immense impact on learning of chemistry. Since the preparation of this module is very easy and simple; it has opened a new way and is very much helpful to teachers in their physical science instruction.

Kuzu (2007) investigated the opinions of K-12 teachers and administrators regarding their need for technology counseling services. According to findings, administrators and teachers agree that having an officially employed technology adviser at their institution to ask for assistance in case they need support will be helpful for their institutions technological infrastructure; having a technology adviser at their institution will help realizing teaching –learning endeavors efficiently; Technology adviser should help employees with their problems and
projects regarding computers software programmes and hardware; technology adviser should receive support from voluntary teachers and students with regard to realizing technological endeavors, and organize teachers and students to realize those endeavors; technology adviser should organize teacher and student seminars regularly so that they can use technology efficiently; technology adviser should contribute to the process of generating organization's technological infrastructure.

**Maniar and Bhatt (2007)** conducted a study on designing educational CD-ROM for higher education students. The major findings of the study revealed that the educational CD-ROM on topic “Graphic Aids” was effective in terms of gain in knowledge and there was significant difference in gain in knowledge amongst the students of experimental group.

**Naser-Nick (2007)** determined the influence of learning styles on learners in e-learning environments. It has been found that for the instructor-based learning, the learning style was irrelevant, but for the web-based learning class, learning style was significantly important. The results showed that students with learning styles Assimilator and Converger did better with the e-learning method. This mean that those learners that like to learn though thinking & watching and thinking & doing would learn better with e-learning.

**Preston & Cuthell (2007)** studied the perspectives of professional educators on ICT to investigate teacher advisers' and teacher educators' professional development. It was found that around a third of the respondents had received no ICT training for three years and some ten per cent had never had any form of formal instruction. In terms of motives for using ICT, equipping learners to be independent featured prominently (48%) as did international collaborations (19%). Very few respondents made any link to supporting vocational learning a key strand of the new 14-19 curriculum.

**Alodiedat, Ahmad Sulieman and Eyadat, Yousef Ahmed (2008)** studied the effect of Intranet use on students' achievement and self-confidence. The study found that experiment group used the intranet and internet more often than the traditional group. Students in the control group and the experimental group had a positive, high level of confidence in all items. Also, the study found that there was no significant difference in achievement based on the number of hours spent using the intranet and
internet; also, there is no significant difference in self-confidence or achievement between male and female students in the control group. In addition, the study found a weak correlation between self-confidence and achievement.

Mansoor (2008) conducted a study on Mathematics web-based learning in schools to know the difficulties and opportunities of using this technology in teaching Mathematics to 13 year old boys studying Mathematics at school. The basic requirements at home were identified, e.g., Mathematics computer software packages, availability of internet access and ability of the parents to provide computers, software and the internet for their sons. Findings of the study revealed a significant improvement in grades, motivation and communication between home and school.

Nimavathi and Gnanadevan (2008) studied the effectiveness of multimedia programme in teaching science at secondary level. The findings of the study explored that there is no significant difference between the experimental group and control group in the achievement of science at pretest level and there is a significant difference between the experimental group and control group in the achievement of science at post-test level. The students learning with the help of multimedia programme fared better in science than the students learning through the conventional method.

Anil (2009) examined the effectiveness of computer-assisted instruction programme as a remediation treatment by comparing the mean achievement scores of pre-test and post-test. He found that Computer-Assisted Instruction Programme in remediation task was successful as the students were able to overcome the difficulty points in the content. So, utilization of computer technology in remedial instruction was found effective.

Meenu (2009) studied the effectiveness of multimedia teaching programme for teaching of English. The study revealed that the students who were taught English through multimedia teaching programme have shown significant improvement in their achievement in English than the students who received instruction through traditional method.

Nimavathi & Gnanadevan (2009) conducted a study on multimedia programme to investigate whether there is a significant difference between the mean study habit
scores of pre-test and post-test for the experimental group who were taught by using multimedia programme. The findings revealed that a significant difference between the mean study habits scores of the pre-test and post-test of experimental group was found, which indicates that the students learning through multimedia fared better in their study habits than the students learning through the conventional method.

Suman (2009) determined the relative effectiveness of E-Content strategy and conventional strategy of teaching of science. The findings of the study explored that mean scores of Science achievement at post-test stage was significantly higher than the mean score of science achievement at pre-test stage of E-content group. The results also revealed that E-content improve achievement in science significantly higher in comparison to Conventional strategy when groups were matched on pre-achievement in science.

Leonard, James & Shawn (2009) investigated the impact of video games on high school students’ engagement and learning about genetics and found significant difference in participants’ level of engagement while interfering with the video game.

Rai (2009) described that the use of Multimedia, not only brings creativity but encompasses all arenas of education through text, graphs, moving images, sound and music with the help of computers.

Ponraj & Sivakumar (2010) examined the effect of CAI software on the achievement in zoology. The study has shown that teaching the zoology by using CAI is more effective than conventional strategy.

Raninga (2010) revealed that teaching through computer-assisted instruction (CAI) is effective for teaching of Mathematics for the students of class VII as compared to the traditional method.

Steve (2010) determined the effect of interactive multimedia simulations and virtual dissection software on depth of learning among students participating in biology and chemistry laboratories. The results indicated that participants changed their depth of learning after completing simulation and virtual dissection software.

Oğuz Serin (2011) studied the effect of computer-based instruction on the Achievement and problem solving skills of the science students. The result of the
study reveals that there is a statistically significant increase in the achievements and problem solving skills of the students in the experimental group that received the computer-based science and technology instruction.

Philip, Jackson & Dave (2011) studied the effect of computer-assisted instruction on student’s attitudes and achievement in Matrices and Transformations in secondary schools in Uasin Gishu District, Kenya. The findings of the research has indicated that computer-assisted instruction (CAI) enhances student achievement, promotes positive attitudes towards Mathematics and instruction, and improves interpersonal relations, few studies have focused on CAI in Kenyan secondary schools Mathematics teaching/learning. Results also revealed higher achievement and positive attitudes with CAI treatment groups. Making connections between the goals of Mathematics education and CAI offers a valuable means for improving mathematical knowledge and skills and hence performance in Mathematics.

Gupta & Tyagi (2011) examined the effectiveness of CAI in Biology among senior secondary school students. The result of the study revealed that post-test achievement scores of experimental group were significantly higher than of control group students. CAI Module was found to be effective in enhancing the achievement of students.

Rekha & Kumar (2011) investigated the effect of smart classrooms on academic achievement of fourth class students of Punjab. The findings showed that lectures given through smart classroom significantly increases the academic achievements of the students.

Abdallah (2012) determined the impact of computer-assisted grammar teaching on EFL pupils’ performance in Jordan. The findings revealed that there is statistically significant difference ($\alpha < 0.05$) between the pupils' achievement mean scores in grammar attributed to the instructional method of teaching. This difference is in favour of the students in the experimental group. Also there was statistically significant difference ($\alpha < 0.05$) between the pupils' achievement mean scores in grammar attributed to stream of study. This difference is in favour of the scientific stream students. It was recommended that English language teachers use computer assisted instruction in their teaching.
Ada, Faith & Victoria (2012) investigated the effect of computer-assisted instruction (CAI) package on the performance of Senior Secondary Students in Mathematics (Algebra) in Awka, Anambra State, Nigeria. The result indicated that students taught using (CAI) package performed significantly better than their counterparts taught using the conventional method of instruction. Students taught using CAI performed better than the control group in retention test. Also there was no significant difference in the post-test performance scores of male and female students taught using CAI of package. Based on the findings it was recommended that Computer-Assistant Program should be encouraged for teaching and learning of mathematics.

Adeyemi (2012) investigated the effect of computer-assisted instruction (CAI) on junior secondary school students’ achievement in social studies. The results indicated that there is no significant main effect of treatment (computer-assisted instruction and conventional method) on student achievement in social studies (F(1,153) = 0.415, P > 0.05). The result also revealed that there is significant main effect of academic ability on students’ achievement in Social Studies (F(1,153) = 7.852, P < 0.05).

Koorosh & Soori (2012) investigated the effect of computer-assisted language learning (CALL) on EFL students’ writing achievement. It was found that CALL users’ achievement in EFL were significantly higher than nonusers (df = 38, p<.05). This significant difference between the two groups favoring CALL users was an indication of the effect of CALL on improving students’ knowledge and competency in EFL.

Semra (2012) demonstrated that teaching mathematics with a computer-assisted instruction method increased student success significantly in mathematics lesson. However, the experimental and control groups did not differ between students’ attitudes towards mathematics.

Sharma (2012) studied the effectiveness of multimedia classroom instruction for developing environmental awareness among elementary school children. The findings indicated that group of students taught through multimedia method of instruction contributes towards raising the achievement and scored higher mean gain.
on the criterion achievement test on environmental awareness of class VII students in environmental science.

**Telima and Aderonmu (2012)** compared problem-solving ability among mathematics students using computer-assisted instruction blended with problem-solving approach (CAI-PS) versus traditional teaching approach (TTP) in teaching basic statistics. The findings of the study revealed that unavailability of CAI equipments and low level of teachers' competency in computer usage affects the use of CAI-PS for content delivery. It was also recommended amongst others that there should be provision of adequate computers and instructional (teaching) related equipments to facilitate mathematics teaching and learning and compulsory inclusion of computer usage in teaching, for all teacher education programmes.

**Gupta & Chirag (2013)** studied the effect of Multimedia Teaching Package in mathematics on academic Achievement of class V students. The results of the study revealed that experimental group students showed significant improvement in their achievement as comparison to the control group students. It further revealed that the boys as well as girls of experimental group when compared with those of control group separately were benefited by multimedia teaching package in terms of their achievement.

**Bindal & Sharma (2013)** revealed that a teacher is expected to know successful integration of ICT into his/her subject area to make learning meaningful. ICTs in education are not transformative on their own transformation requires teachers who can use technology to improve student learning. ICT integration in teaching and learning is being perceived as a necessity and is growing exponentially.

**Hamed (2013)** examined the knowledge, skills and attitudes of Omani social studies teachers to the use of computers in instruction. The results of his study showed that social studies teachers lack computer skills but had positive attitudes towards their application in teaching. The results also showed that half of social studies teachers do not know any websites of Social Studies Centres or journals in either English or Arabic. The study recommended developing teachers' computer skills and knowledge about journals and centers' websites.

**Eze & Olusola (2013)** recommended that teacher training institutions, professional development schools, societies and public educational agencies must continue to identify study and disseminate examples of effective technology integration that
answer professional development needs. Many will become specialists in the use of
distributed learning techniques, the design and development of shared working
spaces and resources, and virtual guides for students who use electronic media.
Ultimately, the use of ICT will enhance the learning experiences for children,
helping them to think and communicate creatively. ICT will also prepare our
children for successful lives and careers in an increasingly technological world.

**Khushnir, Manzhula & Valko (2013)** developed approaches allowed us to
improve a range of disciplines including "Information Technology", which is taught
for students of all teacher specialties. We also applied them to following disciplines:
"Introduction to Information Technology" (for future teachers of elementary school
and Computer Science, the 1st year of study), "Fundamentals of Computer Science
and Applied Linguistics" (translators, the 2nd year of study), and “Office Computer
Technology” (programmers, the 1st year of studies). Students expressed their
positive attitude verbally in the classroom and several students sent e-mails with
gratitude after finishing the discipline.

**Warren (2013)** recommended that to prevent future ICT failures and to give ICT
every chance to be successful in secondary schools, educational practitioners need to
be aware of the ICT risk factors and adopt suitable strategies to reduce them. With
this knowledge, we can expect to achieve our educational goals in a manner that
resonates with our digital native students.

**Chaudhari (2013)** studied the effectiveness of Computer Assisted Instruction (CAI)
instructional Strategy for Biology teaching. The findings concluded that CAI is also
very useful for the achievement of students in biology subject. CAI can be used as
the supplementary tool by the teachers to overcome the problems of Science like
lack of visualization and it may minimize constraint of education.

**Safo, Victoria and Wushishi (2013)** determined the effectiveness of Computer-
Assisted Instructional package (CAIP) on achievement and retention in geometry
among junior secondary schools in Minna Metropolis. The findings revealed that
experimental group performed better than the control group. It was recommended
that government should organized seminars, workshops and symposium for teachers
on the development of computer assisted instructional package to enhance learning
among students.
Gupta & Chirag (2014) developed a multimedia teaching package in mathematics for class V. The study also provided basic concepts and information on the processes and resources involved in multimedia teaching package development which might be of interest to capacity-development managers, faculty members and subject experts etc.

OVERVIEW

After having reviewed the related literature, it was found that most experimental studies stress the effective use of multimedia as a facilitating strategy, it helps in delivering the educational material to students easily and it plays a positive role in enhancing the general trend toward the use of computer in education. It is also determined by various investigators that ICT has a unique strength of communicating difficult concepts in a simple and capturing way and has a positive impact on cognitive achievement, academic achievement, comprehension and application. Moreover, it is a pupil-centred approach. Various researchers had found its utility in various subjects at various levels. Its power of presentation with the integration of resources allows for the creation of a healthy and active atmosphere in the classroom. On the other hand if we specifically explore the utility of IT-Enabled Package or E-content in school subjects at secondary level, many linked issues are still remained unfold. Thus a lot of work needs to be done in this direction. The current study is an attempt to support the previous studies in using the experimental method in studying variables. Perhaps this study will reach scientific results over research ethics in the field of using multimedia software, it helps in revealing the importance of computer in students’ academic achievement to the subject of Science and also it stimulates the activation of multimedia use in academic teaching. Therefore the investigator found it suitable to conduct a study to develop and evaluate the impact of IT-Enabled Instructional Package in Science (Biology).