CHAPTER II

REVIEW OF RELATED LITERATURE

“Since effective research is based upon past knowledge, a review of related literature helps to eliminate the duplication of what has been done and provides useful hypothesis and helpful suggestions for significant investigation. A summary of the writing of recognized authorities and of previous research provides evidence that the researcher is familiar with what is already known and what is still unknown and untested”

– Bett Hohn. S.

2.1 INTRODUCTION

Review of related literature provides a source of the problem of the study; an analogy may be drawn for identifying and selecting the problem for research. For any investigation, the researcher is in need of a fairly good knowledge of the previous work done in that area. The investigator develops the study in one area from the previous experience in the same area as well as in the related area. The researcher should have good foundation in the previous research done in the related area and it should be followed by suggestion for future investigation.

According to W.R.Brog “The literature in any field forms the foundation upon which all future work will be built. If we fear to build the foundation of knowledge provided by the review of literature, our work is likely to be shallow and native and will often duplicate work that has already been done better by someone else.”

In the statement of Best “practically all human knowledge can be found in books and libraries. Unlike other animals that must start a new with each generation, man build upon the accumulated and recorded knowledge make possible progress in all areas of human endeavor”.

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Review of related literature facilitates the researcher to have a clear understanding of the research problem. Through the survey of the related literature and its review, the researcher can identify the significant problems in the research area by avoiding unfruitful and useless problems. The findings of the significant problems are likely to add to the knowledge in a meaningful way. The careful and thorough review of related literature gives the researcher an understanding of the research methodology which is helpful in the selection of sample groups, selection and development of tools and techniques and application of date analysis techniques. The most important purpose for reviewing the related literature is to know about the recommendations of the previous researchers highlighted in their studies for further research.

2.2 OBJECTIVES OF REVIEW OF LITERATURE

1. It provides theories, ideas, explanations, hypotheses which may prove useful in the formulation of a new problem.

2. It indicates whether the evidence already available solves the problem adequately without requiring investigation. It avoids the replication.

3. It provides the sources for hypotheses. The researcher can formulate research hypotheses on the basis of the available studies.

4. It suggests method, procedure, sources of data and statistical techniques appropriate to the solution of the problem.

5. It locates comparative data and findings useful in the interpretation and discussion of the results.

This chapter presents a review of related studies conducted in the field of e-content presentations for the teaching-learning process. A detailed analysis of the related literature promotes a greater understanding of the problem at hand and
design of the study. It also provides a theoretical base for the research and helps the investigator to conceptualize the problem and to choose the design of the present study.

*The related literature can be classified into six categories*

i. Studies Related to CAI, Multimedia Packages and E-content in other Subjects- Abroad

ii. Studies Related to CAI, Multimedia Packages and E-content in other Subjects- India

iii. Studies Related to CAI, Multimedia Packages and E-content in Mathematics- Abroad

iv. Studies Related to CAI, Multimedia Packages and E-content in Mathematics- India

v. Studies Related to Attitude towards E-Content – Abroad

vi. Studies Related to Attitude towards E-Content – India

2.3 *STUDIES RELATED TO CAI, MULTIMEDIA PACKAGES AND E-CONTENT IN OTHER SUBJECTS- ABROAD*

*Amory, Alan; Naicker, Kevin (2001)* evaluated two Biology online software packages used by the students in constructivist environments. Evaluations were conducted via paper-and electric-based software evaluation, students’ interviews, and analyses of student performance (pre-and post-testing, examination results). Results showed that the students enjoyed using the software, found the constructivist learning environments challenging, valued the permanent availability of online information, found the user interface of the software products easy to use and navigate. Analyses of the examination results
showed that the students performed better than in the previous year (traditional lectures). Results for the carbohydrate course were superior to those of the other courses. It appears that interactive components that foster constructivist-based learning skills are more important in online learning environments than presentation of information.

**Chun-Yen Chang (2002)** studied the impact of different forms of multimedia computer-assisted instruction on students’ science achievement. He compared the teacher-centered traditional method with students centered multimedia computer-assisted instruction on the science achievement of the tenth grade students. A total of 244 tenth grade high school students in six science classes participated in the pre-test post-test comparison group experience. During a one week period, one group of students (n=123) were taught by a teacher-centered traditional method, whereas, the other group of students (n=121) was subjected to a student-centered multimedia computer-assisted instruction. An analysis of covariance on the Earth Science - Achievement test, post-test scores with students’ pre-test scores as the covariance was conducted. He found that the teacher-centered teaching approach was more effective in promoting students science achievement on the knowledge and application of the cognitive domain.

**Kekkonen-Monetam et al., (2002)** evaluated the effectiveness of web-based, interactive, multimedia electronic learning materials by comparing the students’ learning outcomes in the lecture and online versions of an introductory computing course at Hong Kong University of Science and Technology. They suggest that the use of carefully designed interactive electronic learning modules fosters higher-order learning outcomes.

**Moreno, Roxana and Mayer, Richard (2002)** conducted a study on “Emerging student in active learning: the case for personalized multimedia messages”. In their study the college students learned about botany through an
agent-based multimedia game. Students received either spoken or identical on-screen text explanations. Results revealed that the students scored higher on retention, transfer, and programme ratings in narration conditions than in text conditions.

*Jha et al. (2002)* made an attempt to study the development and evaluation of an interactive computer-assisted learning program- a novel approach to teaching gynaecological surgery. The objective of this study was to develop an interactive computer-assisted learning (CAL) program on CD-ROM, combing video, illustrations and three-dimensional images, to enhance understanding of vaginal hysterectomy in terms of an anatomy and steps of surgical procedure. A three dimensional image was included to enhance understanding of the complex relationship between the uterus, bladder and rectum. There was an interactive self-assessment section with multiple choice questions and an anatomy self-test. Twelve undergraduate students and sixteen trainees in gynaecology evaluated the CD-ROM as an educational tool. Most of them were satisfied with the program. A need for development of further similar educational software has been identified. The CD-ROM has indentified an innovative and useful approach to teaching operation surgery. The results from the evaluation were positive in terms of the need for similar programs in future.

*Bobby (2004)* experimented on Computer Supported Collaborative Learning (CSCL) in Learning Zoology among the IX Std Students. For the study, the investigator used a Single group design. There were 37 students selected from standard IX for the present investigation. CSCL was implemented to learn the unit in Zoology ‘Organisms and Environment’. Selected students were grouped into 9 based on their performance in the previous achievement test. CSCL includes the following tasks namely-Teacher Presentation (Multimedia), Student Presentation (Multimedia), Assignment and Brain Storming. Each one of the task covers one subunit of the lesson. After completing each task, the investigator assessed their
performance and hence continuous assessment was made. The students participated actively and enthusiastically. The results of his study indicated that there was a significant impact of CSCL in learning Zoology and learning was accelerated by Computer Supported Collaborative Learning.

**Teabo, Sharon, L. (2004)** made a study on the usage of instructional multimedia to enhance interactivity through web-based learning in P-12 settings. The purpose of this study was to analyze multimedia as the instructional teaching used to enhance interactivity in a web-based environment and to illustrate the potential for improved learning with interactive multimedia. An in-depth analysis of an intensity sampling which exhibited high use of instructional media was conducted to corroborate results gathered through quantitative methods, to add validity to this and to examine the participant’s perception of instructional media and their use. The study showed a correlation between the types, and the use of specific instructional media was integrated more frequently at a low level on each taxonomy than others. In-depth analysis, corroborated findings and analysis of emergent themes yielded additional insight regarding the types and way in which instructional media were integrated.

**Norhayati, A.M., & Siew, P.H. (2004)** in their study on “Malaysian Perspective: Designing interactive Multimedia Learning Environment for Moral Values Education” developed an interactive multimedia courseware package for moral values education using traditional Malay oral narratives called CITRA. The foremost objective of the study was to create a pedagogical tool that combines on-screen text, graphics, animation, audio and video in an enticing environment. CITRA, a didactic tool, used CD-ROM and the computer as a means of dissemination. It had four learning modules, namely, the Storytelling World module, Enjoyable Reading World module, Word Enrichment Corner module, and Mind Test Land module. The tool’s most important feature was its user
interaction capability. The findings to the study was that CITRA enabled a positive values among students through the projected images of stories.

**Angeli, Charoula (2005)** did a study on transforming a Teacher Education Method Course through Technology. In this study, and instructional design model was employed for restructuring a teacher education course with technology. The model as applied in a science education method course, which was offered in two different but consecutive semesters with a total enrollment of 111 students in the fall semester and 116 students in the spring semester. Using tools, such as multimedia authoring tools in the fall semester and modelling software in the spring semester, teacher educators designed high quality technology-infused lessons for science and, thereafter, modeled them in classroom for pre-service teachers. An assessment instrument was constructed to assess the pre-service teachers’ technology competency, which was measured in terms of four aspects, namely, (a) selection of appropriate science topics to be taught with technology, (b) use of appropriate technology-supported representations and transformations for science content, (c) use of technology to support teaching strategies, and (d) integration of computer activities with appropriate inquiry-based pedagogy in the science classroom. The results of a MANOVA showed that pre service teachers in the Modelling group outperformed the pre-service teachers’ overall performance in the Multimedia group, $F=21.534$, $p=0.000$. More specifically, the Modelling group outperformed the Multimedia group on only two of the four aspects of technology competency, namely, use of technology to support teaching strategies and integration of computer activities with appropriate pedagogy in the classroom, $F=59.893$, $p=0.000$, and $F=10.943$, $p=0.001$ respectively. The results indicate that the task of preparing pre-service teachers to become technology competent is difficult and requires many efforts for providing them with ample of opportunities during their education to develop the competencies needed to be able to teach with technology.
Glkang A. Noell, J. & Swartz, L. (2005) carried out a study using interactive multimedia to teach "Pedestrian safety: An Exploratory Study". The main objectives of this study were to evaluate an interactive multimedia (IMM) program that teaches the young children safe pedestrian skills. The program uses IMM (animation and video) to teach children critical skills for crossing streets safely. A computer-delivered video assessment and a real-life street simulation were used to measure the effectiveness of the program in teaching safe street-crossing skills. This study found that significant effects were found in the computer delivered and behavioural measures. It was also concluded that children can learn to discriminate dangerous demands in the traffic situations using the IMM program and transfer that knowledge to real-life-environments.

Helen Joy B. H and Shaiju (2005) developed a Computer Assisted Lesson on the topic UNO in History at the Higher Secondary Level and tested the effectiveness of the Computer Assisted Teaching and the Lecture Method of the lesson 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 scores but the mean post-test scores of the CAT group were found to significantly higher than that of the LM group.

Yuen, S.T.S. Naidu, S. & Kodikara, J.K. (2005) in their paper reported a collaborative courseware development project in geotechnical engineering, conducted by the University of Melbourne and Monash University in Australia. The project aimed at developing multimedia learning modules to be used by the lecturers and students. Specific modules developed included videos in DVD format and self-learning programs in CD or web based format. The topics included deep excavation (construction of a multi-level basement in the city of Melbourne) and a laboratory direct shear test. In a climate where student field excursions are becoming increasingly difficult owing to large class sizes and extensive occupational health and safety requirements, the former provides opportunities for the students to gain a
detailed understanding of a complex construction activity undertaken in an urban setting. On the other hand, the laboratory module supplements limited hands-on laboratory experiments undertaken by the students. The modules have been incorporated in elective subjects in geotechnical engineering and also presented as additional information in some other subjects. This paper describes the basis, project execution, and lessons learnt from the collaborative project. Finally, it gives a summary of an evaluation of the deep excavation module based on feedbacks received from a cohort of students. It is evident that the students appreciate the availability of the modules, and perform arguably better in the respective subjects.

Mohd Hafiz Zakaria, Umawathy Techanamurthy and Anusuriya Devaraju (2006) developed a multimedia courseware as a teaching aid for the children with dyslexia focuses on the planning, analysis and design of an e-learning courseware to teach dyslexics to read using the ‘picture thinking’ model. The development of this e-learning courseware involves transforming the traditional content of printed books from passive prints and illustrations into interactive multimedia content. The children with dyslexia and pre-school children aged 5 to 7 were the samples of the study. And the study concludes that the multimedia courseware was helpful to the dyslexic learners as it was picture thinking model and multisensory approach to the best of their ability in comparison with the same teaching approaches used to teach their non-dyslexic counterparts.

Tas, et al (2006) made a study on the effects of computer-assisted instruction material on understanding photosynthesis. The purpose of the study was to investigate the effects of a computer-assisted instruction material on the understanding of photosynthesis. The sample of the study was of two different classes with 53 students in a lycee in the central Trabzon in Turkey. The experimental design was implemented in the study with one class (the control
group) where the traditional instruction was followed; in the other class (the experimental group) the computer-assisted instruction material was followed. The Photosynthesis Achievement Test and Biology Attitude Scale were given to the two groups as a pre-test and post-test. The result showed that the computer-assisted instruction group increased their success about photosynthesis when compared with the traditionally designed science instruction group. Besides, when compared with the control group, there appeared a significantly positive difference in the experiment group students in their attitude toward science as a school subject.

Lau, HYK. Mak, and KL. Ma, H. (2006), have written an article on the Interactive Multimedia E-learning System (IMELS) that was developed to provide a comprehensive problem-based learning environment for the discipline of industrial engineering. It gives an overview of the design of this interactive multimedia E-learning System that facilitates the interactive, web-based teaching and learning of industrial engineering via a problem-based learning paradigm. To demonstrate the functionality of the system, one of the case problems that is incorporated in the system-the performance of system analysis of a production operation of a “virtual company” is presented. Through this example, the article highlights the characteristics of the system and provides and discusses the significance of the features delivered by the IMELS.

Zajaczeck, J. Gots et al. (2006), have created and utilized a web-based, multimedia teaching and learning application “Schoolbook” for neuro radiology. Schoolbook is technically based as a content management system and is realized in a LAMP environment. The content is generated with the help of the developed system and stored in a database. The layout is defined by a PHP application, and the web pages are generated from the system. The results revealed that Schoolbook is realized as an authoring tool so that it can be integrated into daily practice. This enables the teacher to autonomously process the content into the
web-based application which is used for lectures, seminars, and self-study. A multimedia case library is the central building block of Schoolbook for neuro radiology, whereby the learner is provided with original diagnostic and therapeutic data from numerous individual cases. The user can put individual emphasis on key learning points as there are various ways to work with the case histories. Besides the case-based way of teaching and learning, a systematically structured way of dealing with the content is available. It is concluded that eLearning offers various opportunities for teaching and learning in the academic and scientific, as well as in economic contexts. Web-based applications, such as Schoolbook may be beneficial not only for basic university education but also for the realization of international educational programmes, such as the European Master of Medical Science with a major in neuro-radiology.

Leuenberger, H., Menshutina, N., and Betz, G. Puchkov, M.N. (2006), have written an article on “E-learning and Development of New Courses and Scientific work in the field of Pharmaceutical Technology”. Since 2001, the Institute of Pharmaceutical Technology (IPT) at the University of Basel and the Mendeleyev University of Chemical Technology of Russia (MUCTR) have established an institutional partnership (IP), which is supported by the Swiss National Science Foundation (SNF) in the framework of the SCOPES (Scientific Cooperation between Eastern Europe Switzerland) project. The results of this collaboration are the new teaching technologies that were introduced at the MUCTR and the IPT. The former include multimedia lectures in pharmaceutical technology, which were held in parallel at the University of Basel and MUCTR, and the educational web-portal ‘Pharmacy online’, which was awarded a medal at the 4th Moscow International Salon of Innovations. It was found that the multimedia lectures are popular with and helpful for MUCTR students, because they can compensate to a certain extent, the lack of equipment at the MUCTR.
Naik, D.C., Teelock, V. (2006), have written an article entitled “Enhancing the Teaching and Learning of History and Geography through Information and Communications Technology: A Mauritian Experience”. The introduction of information and communications technology (ICT) in the educational system has brought a new dimension to the teaching of history and geography at the primary level. To make teaching and learning of such subjects fun, stimulating, and at the same time interesting, for the curricula, the Virtual Centre for Innovative Learning Technologies (VCILT) has developed an interactive multimedia pedagogical support CD-ROM to be used in Standards 4 and 5 (students aged 8-10) of Mauritian primary schools. The introduction of this interactive multimedia pedagogical support CD-ROM benefitted the students in the teaching of history and geography at the primary level.

Kanellopoulos, D., Sakkopoulos, E., Lytras, M.T., and Sakalidis, A. (2007), in their article titled “Using Web-Based Teaching Interventions in Computer Science Courses” discussed that an open-source management system of Web-based teaching interventions can be used in general for science curriculum courses, and especially for computer science courses. The proposed solution is called the System of Teaching Intelligent Interventions (STII) and facilitates the authoring, deployment, and evaluation of Web-based metaphors. In this paper, they discuss the use of metaphors for assisting the students to comprehend the substance of cognitive concepts and their basic background. STII was applied in a particular educational scenario during the learning process of 228 students attending the course “computer applications.” The presentation of the results from a pilot evaluation of two metaphors demonstrates the usefulness of the system. The evaluation focuses on the impact of the two metaphors on student learning, and on detecting potential correlations between metaphors and the students’ groups. STII evaluation conclusions strongly support that multimedia metaphors can be used as an alternative instructional tool to assist students in
confronting their cognitive constraints and in developing functional understanding of curriculum courses.

_Lanyi, CS., Kosztyan, Z., Kranicz, B., Schanda, J. and Navvab, M. (2007),_ in their article “Using Multimedia Interactive e-teaching in Science”, discussed that color is becoming a key issue in many e-commerce products. This made it necessary to develop a color course easily accessible from the Internet or distributed on CD-ROM. It was described that the electronic approaches were found to be more advantageous than that of the class-room demonstrations to bring the fundamentals of colorimetry to the students with the help of demonstrations.

_Jennings, Kathrine, T., Erik, M. Weaver., and Gabriela, C. (2007)_ preferred to make use of a multimedia DVD for physical Chemistry an analysis of its effectiveness for teaching the content and applications to the current research and its impact on student views of physical chemistry. The objectives of the study were to implement a new multimedia learning tool for physical chemistry in a class setting, and the students’ attitudes and learning gains were examined. The Physical Chemistry in Practice (PCIP) DVD contains multimedia modules that provide an in-depth description of the research of eight different scientists. Each module contains a documentary style video program of the researcher and their laboratory, HTML-based background information about the topic, problems for the students to work on, and links to related information. The DVD was implemented in a physical chemistry laboratory course where the students worked through a module on surface-enhanced Raman spectroscopy (SERS). Data was collected in the form of pre-tests and post-tests of content knowledge and surveys were made about attitudes and academic career choices. The findings revealed that the students showed statistically significant learning gains after using the DVD and showed an increase in their recognition of the applications of physical chemistry to real problems. The students also showed an increased interest in a further study of physical chemistry.
Walker, David A. et al. (2008), studied the E-learning module for Teacher Development: Project REAL. To provide highly qualified teachers and to continue the development of their classroom practices, first-rate professional development is needed. E-learning modules were created to provide quality professional development to the in-service teachers, enhance instruction without time constraints, and offer a common knowledge base of instructional strategies for the in-service and pre-service teachers to improve teacher preparation and provide additional resources for continued development. E-learning modules completed by both the in-service and pre-service teachers establish a common knowledge of best practice of instruction in identified, critical areas. The in-service and pre-service teachers are able to teach lessons using the same strategies and expectations. E-learning modules can also provide valuable resources from other colleges across a university. These modules are available on-line or on a CD-ROM, 24 hours a day, seven days a week from any location. This article describes Project REAL (Rockford Education Alliance), a comprehensive partnership between Northern Illinois University (NIU), Rock Valley College, and Rockford, Illinois Public School (RPS) District 205 with a focus on improving the student performance and enhancing the quality of teacher educators. Project REAL chose E-learning modules as an alternative method to provide professional development.

Abdallah Arman (2009) investigated the effect of E-learning approach on the students’ achievement in Biomedical Instrumentation Course at Palestine Polytechnic University. The study listed the wide use of E-learning at Universities and other organizations all over the world, either to support classroom learning or on its own. With newly developing multimedia technologies, incorporating simultaneous presentations of narration, images, and text, the possibilities for instruction are vast. In this study, an experimental group of (14) students were examined after studying a course using E-learning approach. El Gazzar
Instructional Design Model (2002) instructional design approach was used in the development of e-content. The course was implemented using MOODLE-LMS. Students’ achievement was examined before and after the experiment. The research results proved that there is a significant increase in gain in the achievement. The E-learning has achieved efficiency greater than (80%) in the achievement.

**Suraez, MDA., Artal, CG., and Hernandez, FMT (2009),** in their paper “E-learning multimedia applications: Towards an engineering of content creation” presented the acquired experience in the development and use of multimedia contents for E-learning applications created for some of the subjects of the degree course in the computer science engineering. The deliveries of these contents make use of Internet and video streaming techniques. The result of the work shows students satisfaction, including their comments.

**Kenneth, H. Smith (2009)** made a study on the effect of computer-assisted instruction and field independence on the development of rhythm sight-reading skills of the middle school instrumental music students. The objective of the study was to investigate the effectiveness of computer-assisted instruction (CAI) to teach rhythm reading skills and to discover how it may be influenced by 'subjects' level of field dependence or independence. The sample for the study consisted of 120, middle school instrumental music students divided into four groups based on scores from the Group Embedded figures Test. Each was randomly divided in half. Half were assigned to the experimental group receiving CAI using Music Ace 2 software, and the control group received no CAI treatment. The CAI was administered half an hour a week for eight weeks. A pre-and post-test of subjects' abilities to read and perform rhythms were measured using the Rhythm Performance Scale. The findings of the study showed that there was significant difference to be found between the test score improvements of the experimental and control groups. However, significant
findings were found to show that the field-independent subjects overall performed on the rhythm performance test than the field dependent subjects.

**Yusuf, Mudasiru and Afolabi, Adedeji (2010)** studied the effects of Computer Assisted Instruction (CAI) on the secondary school students’ performance in Biology. The finding of the study showed that the performance of the students exposed to CAI either individually or cooperatively were better than their counterparts exposed to the conventional classroom instructions. Recommendations were made on the need to develop relevant CAI packages for teaching biology in the Nigerian Secondary Schools.

**Elizabeth A. Fisher and Vivian H. Wright (2010)** have done a qualitative study investigating the effectiveness of implementing usability testing into online course development for improved course design. For the purpose of this study, usability testing refers to iterations of testing that inform changes in the course design in a cyclic fashion. Data were collected during the spring 2009 semester at a major research university in the Southeast. Fourteen freshmen participants took part in the study. The participants were observed as they completed predefined tasks. Data were collected through video recordings, surveys, observer logs, and journaling. The findings indicated that the usability testing may provide a model for improved online course design.

**Michele Biasutti, (2011)**, did a study on the student experience of a collaborative E-learning university module. The aim of this paper was to present a picture of student experience of a collaborative E-learning module in an asynchronous E-learning environment. A distance learning module on music education worth five credit points for a bachelor online degree for primary school educating teachers was assessed using a self-evaluation questionnaire that gathered quantitative and qualitative data about student satisfaction of the collaborative E-learning activity. The quantitative part of the questionnaire
consisted of 27 closed questions on a 10-point likert scale and offered data about satisfaction with the module. The qualitative part of the questionnaire provided an insight into the participant perspective of the online collaborative experience. General open questions on satisfaction and dissatisfaction were analyzed with an inductive analysis which showed the evaluation criteria used by 92 students. The results of the analysis showed five themes of the participants’ perspectives, which were interpreted by the researcher as: teamwork, cognitive, operating, organizing, and emotive/ethic for the positive aspects and teamwork, operating, organizing, and emotive/ethic for the aspects to be improved. The aspects that were associated with satisfaction included: collaborating, comparing ideas, sharing knowledge and skills to support each other, peer learning, analyzing and integrating different points of view, the usability of the platform, group planning and workload management. Aspects of the student learning experience that should inform the improvements of E-learning include: more collaboration between the students since some students engage differently; more coordination and organization, the workload management in the group activities, some technical problems such as updating modifications. The participants’ results in the module increased their didactic potential as primary school teachers. The findings are discussed in relation to their potential impact on developing collaborative activities addressed to teacher education in distance learning. Implications for future research are also considered.

*Campbell, Kristin R., Wilson, Sandra B., Wilson, P., and Christopher He, Zhenli (2011)*, in their paper titled, “Interactive Online Tools for Teaching Plant Identification”, described the interactive review exercises that were developed as the online learning component of an existing native plant landscaping course. The instruments were designed with specific goals for the students to 1) test their plant identification knowledge, 2) practice leaf terminology with specific plant examples, and 3) associate landscape performance with native ecosystem
characteristics. The plant identification tool was developed within a spreadsheet application using formulas consisting of logic statements. This tool tested the students' ability to identify plants and spell scientific and common names associated with high-resolution plant images. The leaf terminology tool was developed using a multimedia platform. It used a drag-and-drop interface where students were asked to associate a specific leaf term (i.e., margin, apex, base, texture, arrangement) with a scanned image that best matches the taxonomic term. The ecosystem tool, also developed using a multimedia platform, used digital images capture for each of Florida’s major ecosystems in conjunction with sets of plant combinations and site characteristics. The students selected the appropriate choices and submitted their answers online, after which they received immediate feedback. The students reported an improvement in plant recognition after they had access to these identification tools. These interactive learning tools not only benefit the students enrolled in this specific course but can be adapted to a variety of online courses nationwide.

Koehler, N.A., Thompson, A.D., and Phye, G.D. (2011), attempted a design study on “A design study of a multimedia instructional grammar program with embedded tracking”. The study meant to demonstrate the feasibility of integrating three rather different theoretical perspectives for future efforts in multimedia instructional design. A multimedia instructional grammar program contextualized within the teaching of English as a Second Language (ESL) program was developed and evaluated. The program design was grounded in Mayer’s Multimedia Learning Theory (2001), Sweller’s Cognitive Load Theory (CLT, 2005), and cognitive training theory using an inductive reasoning paradigm (Klauer and Phye, Rev Educ Res 78(1): 85-124, 2008). Two studies involving ten and four adult ESL learners were conducted in a Midwest community college. Grammar teaching occurred within the context of history and geography of the USA. The students with low prior knowledge of passive voice grammar concepts,
intermediate level of general vocabulary, and an adequate basic knowledge of content (basic geography and history) benefited most from the program. The preliminary results are encouraging for the aforementioned integrative efforts.

**Ketut Budiasta, A.A.(2011)** conducted a study on inquiry teaching-learning using video recorded modeling as a way to teach science in distance education. Developing an instructional program involving a video-based model of teaching in integrated with inquiry learning in in-service teaching program was the prime objective of the study. Sixty-three in-service teachers enrolled in the Bachelor’s programme at university of Indonesia and 454 Elementary school were involved in the process of designing and validating the model. Pre-test and post-test data showed that student teachers achievement increased significantly. It improved the students-teacher attitude and performance which of course correlated with student achievement.

**Anderson, Janice and Barnett, Michael (2011)** conducted a study Using Video Games to Support Pre-Service Elementary Teachers Learning of Basic Physics Principles. The purpose of this work is to share our findings in using video gaming technology to facilitate the understanding of basic electromagnetism with the pre-service elementary teachers. To this end we explored the impact of using a game called “supercharged!” on the pre-service teachers’ understanding of electromagnetic concepts compared to the students who conducted a more traditional inquiry oriented investigation of the same concepts. This study was a part of a larger design experiment examining the pedagogical potential of “Supercharged!” the control group learned through a series of guided inquiry methods while the experimental group played “Supercharged! during the laboratory sections of the science course. There was significant difference F(2,134)=4.8, p less than 0.05, eta[superscript 2] = 0.59 between the control and experimental groups on the gains from pre-to-post assessment with an effect size of d=0.72. However, while the students in the experimental group performed
better than their control group peers, they rated their knowledge of the topic lower than the control group (M[subscript post-control] = 3.0, M[subscript post-experiment] = 2.7, leading to further examination of their laboratory journals. Results of this study show that video games can lead to positive learning outcomes, as demonstrated by the increase in test scores from pre-to-post assessment. Additionally, this study also suggests that a complementary approach, in which video games and hands-on activities are integrated, with each activity informing the other, could be a very powerful technique for supporting students’ scientific understanding. Further, our findings suggest that video game designers should embed meta-cognitive activities such as reflective opportunities into educational video games to provide scaffolds for students and to reinforce that they are engaged in an educational learning experience.

_Hsu, Pi-Sui (2012)_ conducted a study on Examining the Impact of Educational Technology Courses on Pre-service Teachers’ Development of Technological Pedagogical Content Knowledge, the purpose of this qualitative study was to examine the impact of educational technology course on pre-service teachers’ development of knowledge of technology integration in a teacher preparation program in the USA. The present study was conducted with eight pre-service teachers enrolled in the elementary teacher education program at a large university in the mid-western USA. Data source included interviews, documents and observations. The findings indentified knowledge of technology integration the pre-service teachers developed and identified knowledge of technology integration needed in the technology integration courses. The present study provided a number of suggestions on different activities that could be built into educational technology course to better prepare pre-service teachers to teach with technology.

_Hui-Yi Liang and Chih-Chien Yang (2013)_ studied the effects of applying computer assisted instruction (CAI) in this case, LIVE ABC on college freshmen’s
English vocabulary development. Two group (high-proficiency and low-proficiency) of college freshmen from Chienkuo Technology University were used in the study. Each group comprised 50 students (totally 52 male and 48 female). This study was conducted in the fall semester of 2012-2013 and lasted for 18 weeks. A pre-test was administrated at the beginning of the study and a post-test immediately after its completion. The study evaluated the student performance using scores on individual semester tests (pre-test and post-test). In addition, a questionnaire was developed to assist the study. The research method applied Grey Relational Model to analyze the assembled data and decide on an effectiveness rating.

The major findings of the study were: Where students used computer-assisted learning in vocabulary building their test results were generally better. Low-proficiency students benefited more form CAI than high-proficiency students. All the students developed greater fluency, more precise pronunciation and better word understanding. Looking at gender, female students benefited more than the male students. The study also came up with some suggestions for further research in the future.

Kamith Osman and Tien Tien Lee (2013) carried out a study on the Impact of interactive multimedia module with pedagogical agents (IMMPA) on students understanding and motivation in the learning of Electrochemistry (EC). Non equivalent pre test-post test control group design was carried out in the study. Instruments involved were a pre and post test, a pre- and post motivation questionnaire and the IMMPA EC Lab. The results revealed a significant difference between the control group and the experimental group in the understanding of concepts in learning Electrochemistry.

Wolter, et. al., (2013) studied whether an online, multimedia case study can influence the students’ performance, motivation, and perceptions of science in
collegiate level biology classes. One hundred and eight students in 5 classes from 4 campuses in the United States and Puerto Rico participated in data collection (performance tests, surveys and focus group interviews). The pre- and post-test results increased after the students participated in the learning environment $F(1,80) = 17.256, p \leq 0.01$, $\eta^2 = 0.177$). Student confidence in their knowledge also increased. During the focus group interviews the students reported that the project was a good learning experience (95%), would help with future classes or careers (87%), and stimulated student curiosity by demonstrating the application of theoretical knowledge in real-world situations (64%). The learning environment motivated the students by making material relevant, which resulted in better performance. This pedagogical tool is not instructor dependent, and is adaptable.

_Doerr H. M and Thompson (2014)_ explored how the teacher educators understand their pre-service secondary teachers through the multimedia case studies of practice. The results implied that multimedia case studies of practice can serve as vehicles for revealing the knowledge and practice of the teacher educators, as they engage in supporting the professional development of pre-service teachers.

_Rommel L. Verecio (2014)_ conducted a study on Students’ Evaluation of an Interactive Multimedia Courseware.

Educational researchers usually study the students’ performance in order to better understand whether their test scores would improve after they have been exposed to certain technologies that aid learning. The students’ role in such studies cannot be undermined especially that they can be a valuable resource in the evaluation of coursewares for their own classes. This study aimed to develop and evaluate an interactive multimedia courseware in the teaching and learning of Fundamentals of Problem Solving and Programming. Descriptive survey method
was used which involved questionnaire, interviews, and observations. Eighty students enrolled in the subject served as respondents. They were asked to evaluate the courseware for content, manner of presentation, and usefulness of the materials.

The findings of the study showed that the developed courseware facilitates and enhances learning process in the classroom; arouses and maintains positive attitude of the students towards learning the subject because of novelty of the materials used; and contributes consistent improvement in the ability to define and measure students’ attainment of educational goals. These results could encourage the teachers and the researchers in developing their own coursewares.

**Jifeng Cao (2014)** conducted a Study on Designing and Evaluating Multimedia Courseware in EST Teaching.

English for science and technology (EST) teaching is different from normal English teaching mainly due to students’ lack of contact with the discussed topics in real life. And the feasibility of taking use of the multimedia technology in EST class has been mentioned by many scholars. However, there are a few papers referring to the way to design multimedia courseware for EST class and how to assess the effect of the designed courseware. This paper aims at sharing the author opinion and experience on principles and steps of designing and assessing multimedia courseware for EST class.

**Fui-Theng and Mai Cao (2014)** conducted a Study on Interactive Multimedia Learning: Innovating Classroom Education in A Malaysian University

This research study was conducted at INTI International University, and aimed at enhancing the quality of classroom learning for University students with three important emphases: Gagne’s instructional model, multimedia, and student-centred learning. An Interactive Learning Module (ILM) was developed as the core component in forming the multimedia-mediated student-centred learning
environment (MMSLE) to improve the quality of student learning. The impacts on student learning were investigated through pre-test and post-test, questionnaires, open-ended questions and interview. A significant improvement was found in the test results, and shows that this learning environment has enhanced the students’ learning achievement. The students also show positive attitude change as they became more active and motivated in the learning process. A framework named MMSLE was proposed to provide a guideline for the educators in Malaysian Universities to foster education innovations as alternatives to the conventional classroom teaching and learning methodology.

Li MA, Zhenmei SHI (2014) conducted a Study on Factors Interfering Students’ Learning Effect in Multimedia-Based ESL Classes in China

Multimedia technology has become a popular and indispensable part of ESL teaching with its distinguished features of richness in texts, graphics, animation, sound and etc. However, its drawbacks are recognized and studied by an increasing number of researchers. In this paper, the author analyzes three key factors that interfere students’ learning effect in the multimedia-based ESL classes in China, ie. overload information, aural and visual interference, shortage of affective communication, and proposes some countermeasures. It is suggested that the instructors, as the guide of students’ learning activities, should learn some theories of multimedia learning and put them into practice when designing the teaching content and making courseware for the learners-oriented ESL classes assisted by multimedia technology.

Fazzlilian Mohamed Adnan Khan and Mona Masood (2015) conducted a study on The Effectiveness of an Interactive Multimedia Courseware with Cooperative Mastery Approach in Enhancing Higher Order Thinking Skills in Learning Cellular Respiration
The main objective of this study is to integrate mastery and cooperative learning approaches together with an interactive multimedia to enhance the students’ high order thinking skills in the learning of Cellular Respiration. A multimedia interactive courseware was developed and applied in three different strategies, namely the Multimedia-assisted Mastery Learning (MML), Multimedia-assisted Cooperative Learning (MCL) and Multimedia-assisted Cooperative Mastery Learning (MCML). The MML used a self-learning approach while MCL and MCML involve learning in groups. This study involved a quasi-experimental design whereby the domain scores of analysing, evaluating and synthesizing were the three dependent variables. The independent variable was the interactive multimedia courseware with the three approaches. Eighty-four, 88 and 90 pre-university students went through the MML, MCL, and MCML respectively. The MANCOVA was applied to analyse the performance scores of each of the three higher order thinking skills based on the three approaches with the implemented courseware. The result revealed that the MML and MCML students performed significantly better in the creating domain score compared to MCL. Overall, the findings of this study suggest that the multimedia interactive courseware with the combination of mastery and cooperative learning approaches brings a positive effect in the learning of Cellular Respiration.

Mohd Nor Hajar Hasrol Jono, et. al., (2016), conducted a study on “Effectiveness of Courseware Presentation Using Learning Theory for a Programming Subject”.

The need to integrate multimedia in the process of teaching and learning at all level of education is becoming more significant. Multimedia based e-learning is seen as an effective alternative in teaching and learning process. This method is able to create a student-centered learning where students are encouraged of being independence; study at their own pace and at their own place. Nevertheless, the rapid development of information and communication technologies (ICT) in
today’s world has necessitate a new trend in the presentation of information in the form of flash video, which is more easy to understand and accessible instantly to users. The research is undertaken by introducing multimedia courseware by maintaining the concept of Gagne Theory of Nine Events. A new courseware entitled “Introduction to Computer Programming C++” that has been developed using learning theory was being studied to examine the effectiveness of courseware presentation using learning theory that may allow users to interact simultaneously with the material. The courseware is expected to be an effective teaching aid to entice students in the subject programming. The study was conducted in Faculty Applied Science, Universiti Teknologi Mara Shah Alam. Thirty students were selected as respondents. The courseware evaluation was implemented using a set of questionnaire that used a 5 point Likert scale. This questionnaire was administered to the respondents during their first semester. The results obtained were very positive and encouraging. Students generally found the multimedia-mediated web-based learning environment were enjoyable and motivating, also were able to demonstrate their learning and skills of the subject area.

Salasiyas Mat Kila and Mai Shihah Abdullah (2016), conducted a study on “Immunization sub-topic and interactive multimedia courseware for Malaysian students: An impact study”.

The term alternative framework or misconceptions refers to any ideas held by students which are inconsistent or in conflict with the general idea accepted by scientists. Teachers need to uncover student’s prior knowledge, identify their alternative framework and subsequently find effective strategies and appropriate learning style for students to solve the problems. This action research aims to study the effects of interactive multimedia courseware in addressing the problems of students’ alternative frameworks in Immunization topic and identify the perceptions of students and lecturers about the appropriateness and quality of the
software. Samples of the study included one lecturer and 30 students sitting for the Bachelor of Education in Biology and Bachelor of Science in Biology programmes in two Malaysia’s universities. An interactive multimedia courseware entitled “Immunization” was developed using PowerPoint 2010 software. Questionnaires on the effectiveness of the courseware, pretest and post-test were administered as the instruments in this study. Results of data analysis showed that there was a statistically significant difference between the means of post-test and the pretest scores. Students of the Bachelor of Science in Biology programme showed higher and better achievement scores as compared to their counterparts of the Bachelor of Education in Biology programme after using the interactive multimedia courseware. The majority of the students and lecturers agreed that the adoption of this courseware helped increase students’ understanding of the Immunization topic.

2.4 STUDIES RELATED TO CAI, MULTIMEDIA PACKAGES AND E-CONTENT IN OTHER SUBJECTS- INDIA

Sharma and Sansarwal (2002) studied on “Comparison among video-based instructional Strategies for teaching Science at class IX level in terms of Achievement.” One of the main objectives was to find out whether there is any significant difference in teaching Science to class IX through video based instruction. The major findings were (a) The treatment had significant effect on achievement in science of students belonging to different video-based instructional strategies for teaching science. (b) The video viewing followed by discussion was significant by higher than those of video viewing only.

Shanthi and Amalraj(2003) studied the effectiveness of Computer Assisted Learning on the achievement of students studying through CAL and traditional methods of instruction and they 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 with the post-test scores of the control and experimental group separately. It revealed that both Lecture Method and CAL have had significant effect on the achievement of the students. At the same time, when the comparison was made on the achievement between the control group and the experimental group, the experimental group’s achievement score was significantly high. This shows that CAL has made a significant favourable effect on achievement in Bio-Zoology.

Vasanthi and Hema (2003) studied the effectiveness of teaching chemistry through Computer Assisted Instruction over the Traditional Teaching Method. In this study, the respondents for the investigation were I year B.E. students. There were 220 students in 1 year B.E. Based on their performance in a class test, 60 students were selected. Those 60 students were divided into two equal groups of 30 each on the basis of marks obtained in the class test. A group of 30 students was taken as the control group and the remaining 30 was taken as the experimental group. A common pre-test was administered to both the groups. The pre test was of the multiple-choice type. The ‘t’ test was administered to find out the significance of the difference between the mean scores of the control group and the experimental group in the pre-test. The analysis proved that there was no significant difference between the two groups. It established the fact that the two groups were homogenous. The software was developed in Visual Basic Version 6. It provided a multimedia platform to attract the senses of the learner for easy and happy learning. The results showed that: 1) There was no significant difference between the mean score in the pre-test of the control group and the experimental group. 2) There was significant difference between the mean scores in the post test of the control group and the experimental group. 3) There was significant difference between
the mean gain score of the control group taught through TIM and the experimental group administered CAI in all units put together (Electro Chemistry and Banding). From the findings, it could be concluded that teaching chemistry through CAI was found to be more effective than teaching through the traditional method.

**Annaraja and Felcia Persis Rani (2003)** developed a computer animated package in biology and found out the effectiveness of computer animated packages in teaching biology to the VIII standard students. They used Power Point for developing the computer-animated package in biology. Each slide was designed for a specific topic, the investigators developed a computer-animated package by various animation effects like appear, fly, swivel, spiral etc., and the slides were presented with the help of the multimedia computer. The ‘t’–test result indicated that the experimental group was better than the control group in achievement in Biology. This may be due to the fact that the experimental treatment was effective in learning Biology. Further, it showed that the animation given in power point slides drew the attention of the students. Moreover, the computer-animated technique motivated the students to learn Biology.

**Beena Y. Desai, (2004)** made a comparative study of the efficacy of teaching through the traditional method and the multimedia approach in the subject of home science. Some of the objectives of the study were (1) to develop a multimedia package for teaching the subject of nutrition (Protein) to the undergraduate level students of Home Science, (2) To find out the effectiveness of the multimedia package in terms of achievement of the students, and (3) To compare the achievements of the students learning through the multimedia approach and the traditional way of teaching. It was an experimental study which employed the experimental group and control group design. The sample of the study was 98 student of B.A first year home science (2001-2002) of Smt.J.P.Shroff Arts College, Valsad. The investigator developed the multimedia
package which constituted transparencies, pie graph, charts diagrams, pictures, video tape, audio tape, and slide set. All the tests pre-test, retention test, and opinionnaires were well constructed by the investigator. The intelligence test by Desai had been adopted in the study. In the present study, for data analysis T-test and F-test were appropriately employed. Some of the major findings were that the mean achievement of the experimental group was found significantly higher than that of the control group. From the post-test to retention test almost equal reduction in the performance was found in both the groups. The students were found to have favourable opinions towards the multimedia approach. The study had found relative efficacy of teaching through the traditional method and the multimedia approach in the subject of Home Science, particularly the topic, “Proteins”.

Mirdula D. Ramade (2004) researched on the “Effectiveness Study and Critical Evaluation of a Computer Assisted Instruction package developed for teacher educations”. One of the main objectives of her study was to find the effectiveness of computer assisted Instruction. The major findings were (a) The findings which were both qualitative and quantitative revealed that the presentation was effective in bringing about learning (b) It was also effective in evoking positive-reactions assisted instruction in the teaching – learning.

Nirmala Sundararaj (2005) attempted to find out the attitude towards computer education of the B.Ed., trainees of Tamil Nadu Open University. The objectives of the study were to find the significant difference between male and female. Rural and urban and arts and science group B.Ed., trainees in their attitude towards computer education. The investigator adopted the survey method for studying the problem. The sample of the study consisted of 60 B.Ed., Trainees. The investigator developed a tool to measure the attitude towards computer education. The data were analyzed by using mean, S.D and ‘t’
test. The findings revealed that the B.Ed., students of Tamil Nadu Open University expressed a favourable attitude towards computer education. Their attitude differed in terms of sex, residence, and the group of study.

Arulsamy, S. (2005) compared the effectiveness of interactive multimedia CD-based learning with the conventional teaching method with science group students. The sample for the study consisted of 50 learners from the XI standard of Sri N.Krishanrajulu Chettiar Government Girls Higher Secondary school, Kurusukuppam, Pondicherry. By means of a pre-test and post-test, it was observed that the experimental group’s performance was far superior to the control group. The study clearly revealed the supremacy of the interactive multimedia CD-based learning courseware.

Subbaiah. S (2005) developed a user-friendly prototype multimedia courseware package as a communication technology in teacher education (i.e. learning to learn with information technology ) and produced it in a CD-ROM. The study is an appropriate blend of positivist descriptive method with normative survey technique and experimental method of study. The sample was taken from 29 District Institutes of Education and Training from Tamil Nadu, 71 English teacher, educators and 200 teacher trainees, using probability sampling method for the study. The tools were: (1) Questionnaire, (2) Attitude scale, (3) Interviews, (4) Diary analysis used for data collection.

The findings of the study states that (1) Sixty-six percent of the teacher educators did not know the basic principles of computer. (2) It was unfortunate that the ICT practices had not seen the widespread application in teacher education. (3) Attitude of the teacher educators towards ICT was quite positive. (4) It revealed that the focus of computer equipment problem had both quantity problem (not enough computers) as well as quality problem.
Johnson (2006) studied the effectiveness of interactive multimedia approach over the conventional method in teaching physics for the XII Standard students. The experimental method was used. The total sample was 80. The students belonged to the XII std of Blessed Mother Teresa Model Higher Secondary School in Pondicherry. He used the ‘t’ test score to find out the difference between the pre-test and post-test results. He found that there was a significant difference between the experimental group and the control group of their achievements in the post test. It also stated that the multimedia approach made the teaching learning process effective and enhanced mastery level in the subject.

Anil Tanaji Patil (2006) developed a multimedia instructional system on computer education for B.Ed., pupil teachers. Some of the objectives of the study were to test the effectiveness of the constructed multimedia instructional system and to compare the effectiveness of the constructed multimedia instructional system with the conventional system of instruction. After ascertaining the needs in the context of computer education, the multimedia instructional system was well designed and developed. Alpha testing was done to further develop the system through the expertise available. The pilot testing of the prototype was done through two group pre-test post-test design (20(12+8), & 20(12+8). Final implementation of the multimedia instructional system was done on a sample of 64 pupil-teachers (32(20+12), 32(20+12), employing the Solomon Four Group Experimental design. The study arrived at a few meaningful findings: (1) It was found feasible to design, develop, and implement a computer based multimedia instruction system for computer education; (2) No significant difference was found between the performance of the pupil teachers of the control and experimental group on pre-test. (3) Significant difference was found between the performance of the pupil teachers of the control group and the experimental group on post-test.
Nirmala Sundara Raj, (2006) made an attempt to develop visual basic-based computer assisted instruction and computer animated packages in zoology and their effectiveness on achievement of the plus one students. The objectives of the study were i) to develop a visual basic based CAI package in zoology for plus one students, ii) to develop a computer animate package for teaching zoology to the plus one students, iii) to find out the effectiveness of the visual basic-based CAI package and the computer-animated package in teaching of zoology to the plus one students. The group which was taught with the help of the CAI package was called the CAI group. The group which was taught with the help of the computer animated package was called the multimedia group. The experimental and control groups were formed only on the basis of the students’ marks in science in the SSLC public examination. One hundred and five girls were selected randomly as the sample of the study. The parallel and equivalent group design was adopted in the study. Three groups with thirty-five students each were selected as the control group (Child Jesus Girls’ Higher Secondary School, Palayamkottai) and two experimental groups (St.Ignatius Convent Higher Secondary School, Palayamkottai). The tools used in the study were (i) visual basic-based CAI package in zoology, (ii) computer-animated package in zoology, (iii) achievement test in zoology, (iv) attitude towards computer education, (v) Aaron’s socio-economic status scale (1976) and (iv) Cattell’s Culture fair Intelligence Test (1961). The statistics used in the study were mean and standard deviation, T-scores, t-test F-test (ANOVA), Chi-square test, correlation, and multiple correlations. Some of the findings of the study were (i) the t-test result showed that the CAI group students were better than the control group students in their gain scores. This may be due to the fact that the developed CAI package was effective in teaching zoology to XI standard students. (ii) The t-test result revealed that the multimedia group was better than the control group in their gain scores and attainment of the knowledge, understanding and skill objectives in
zoology. This might have been due to the fact that the computer-animated package was effective for the students in learning zoology.

**Patil, A.T (2006)** developed a multimedia instructional system on computer education for the B.Ed., pupil-teachers and studied its effectiveness. Final implementation of the Multimedia, instructional System was done on a sample of 64 pupil-teachers ( 32 (20+12), 32(20+12)), employing Solomon four group Experimental design.

The study has arrived at quite meaningful findings viz., Significant difference was found between the performance of the pupil teachers of the control group and the experimental group on post-test. There is significant difference between the gains in achievement in terms of scores in pre-test and post-test of the pupil-teachers from the control and experimental groups in retention test.

**Jothi, K.B.S. (2007)** made an experimental study to find out the impact of computer-based learning of chemistry. The objectives of the study were to prepare a self-instructional module on the topic ‘Chemical Bond’ for the IX Standard chemistry classes and to compare the effectiveness of the self-instructional module with the conventional teaching method. To select the students for both the control and experimental groups, the researches followed matched pairs technique. 40 students, studying in IX Standard of Little Star High School, Madannapet were considered as the sample for the study. Moreover the test prepared by the investigator from the lessons ‘Properties of Gases’ and ‘Chemical Bond’ were used in the pre-test and post-test, respectively. The study clearly revealed that the self-instructional module prepared by the researcher through simple power point presentation had immense impact on the learning of chemistry.

**William, B. Edward (2007)** developed an Interactive Multimedia CD based learning Courseware for teaching physics at the Higher Secondary level. The
sample of the study consists of 15 students in both the control and the experimental group each. The study was conducted in Pondicherry school. The pre-test post-test control group design was used in this study.

It was found that the Interactive Multimedia CD-based learning courseware was effective. The mean scores of the post test of the experimental group were higher than that of the control group, indicating significant difference at 0.05 level. Also the experimental group had expressed a favourable attitude towards the Interactive Multimedia CD-based learning courseware.

*Vishnu Panddurang Shikhare (2007)* carried out a study on the Development of Multimedia Instructional System on Educational Technology for the B.Ed., student teachers. The experimental implementation was done on the sample of 120 pupil teachers from the Barshi and Solapur Colleges of Education, employing the Soloman 4 Group Experimental Design. The characteristics of all the tools constructed for the Study namely, Questionnaire, Evaluation Forms, and Achievement Tests had been well established. The data had been analyzed with the help of appropriate statistical and non statistical techniques. F-test and t-test have been used for data analysis.

The study concluded that there was significant difference between the gains in achievement in terms of mean scores in the pre-test over post-test of the student-teachers from the Control and Experimental Group. It revealed that the Multimedia Instructional System was found more effective than the Conventional Instructional System.

*Jebaraj, G., and Mohanasundaram, K. (2008)* developed web enabled e-content on teaching of physics at the Tertiary Level which included the following objectives: (1) to develop and validate an e-content on the “Solar System” (ii) to find the effectiveness of e-content on the “Solar System” in teaching beyond cognition at the tertiary level, and (ii) to find out the differences in achievement
between the teacher trainees learning the “Solar System” through e-content with respect to gender and subject of study. The experimental method, using the pre-test post-test method, was adopted. The data were converted into percentage and subjected to the ‘t’ test. The study indicated that the experimental group and the control groups differ in their achievement.

Golda Grena Rajathi.P (2008) studied the “Effectiveness of Multimedia Instructional Strategies in Teaching Science among the District Institute of Education and Training students.” The sample of the study consists of 30 students in both control and experimental group each. The statistical techniques employed in the study were appropriate statistical and non-statistical techniques F-test and t-test.

The study showed positive results of using Multimedia Instructional Strategies (MIS). That is, MIS was found to be effective in terms of the student’s achievement. The student’s achievement through MIS was found significantly higher in Science than that of the students taught through traditional method.

Kannan, K. & Ahrar Husain (2008) conducted a study on the effectiveness of use of computer technology in teaching the concepts of physics at the senior secondary level. Some of the important objectives of the study were (i) to compare computer operating children with their normal (non computer) counterparts, and (ii) to study how the computers help children in their intellectual development, like, critical thinking and problem solving to determine and also to what extent computer technology helps students to understand the difficult physical concepts. The tools used were a questionnaire circulated to 50 physics PGTs teaching physics at senior secondary schools in the government aided and public schools and their responses were studied. More over the investigator himself prepared software materials for physics concepts for Standards XI and XII. NPSC (National Progressive Schools Conference) school students were
considered to undergo the achievement test. Two experimental groups and one control group were considered for the research study among the students. They were: Experimental Group I-learning by computer-assisted teaching, Experimental Group 2-learning by accessing computers without the aid of the teachers, and Control Group 3-learning by traditional method. The findings of the study were that computer-assisted teaching was the best method to teach the concepts of physics at the senior secondary level. There wasn’t much profitable learning by the student just by using computer technology to learn the concepts of physics without the aid of the teachers or by the traditional method of teaching physics.

Mohanasundaram, K. and Soosairaj, J. (2008) developed a web-based classroom instruction in learning mathematics with reference to attitude, interaction and web skills of higher secondary students to find out the effectiveness of the web-based class room instruction method in learning mathematics over the conventional method. This study followed a pre-test treatment post-test equivalent two groups’ experimental design. The experimental group students who learnt through web=based class room instruction achieved more in mathematics than the control group students who learnt through the conventional method. The web-based class room instruction method is more effective than the conventional method in improving the achievement of students in mathematics.

Babu. R and Vimala. T.S.(2008) constructed and validated multimedia instructional materials for developing learning skills in accountancy learning and compared the error level of the students in pre-test and post-test. The study was carried out with 240 students studying accountancy at the Higher Secondary level. Out of these 120 students were boys and 120 girls at the Higher Secondary level belonging to aided schools and corporation schools from Chennai city only.
The research findings states that (1) there were significant differences between the pre-test and post-test errors of the experimental group aided school students with respect to remediation in multimedia method in the errors of principal, omission, recording, costing and other type of errors. But there were no significant difference between the pre-test and post-test error of the experimental group aided school students with respect to the remediation in multi-media method in the error of posting. (2) there was significant difference between the pre-test and post-test errors of the experimental group of the corporation school students with respect to the remediation in the multimedia method in error of principal, omission, recording, costing and other type of errors.

Patel .J. A(2009) Development and Implementation of CAI to teach English grammar to the standard VIII students in different modes viz., only CAI, CAI with repetition, CAI with discussion. The sample of the present study consisted of 26 students in both the control and experimental group each. The required data were collected with the help of Pre-test post-test and reaction scale which were constructed by the researcher. In between pre-test and post-test the researcher implemented the intervention program in the form of CAI package for ten days.

The study results in from the three modes of the presentation of this CAI, the mode viz., teaching through ‘CAI with discussion’ was found significantly superior in comparison to other two modes. Also the achievement of the students taught through only CAI was found significantly higher in English Grammar than that of the students taught through traditional method.

Anita Rastogi and Babita Parashar (2009) developed an e-content package following Gagne’s instructional design model based on the concept of micro-teaching. It was tried on the student teachers in an experimental situation in this study. It revealed that the E-learning environment makes the students retro-
active, participating in the learning process, as opposed to being passive in the traditional teaching environment and makes their perception about learning positive and encouraging. The e-content proved effective in enhancing their level of achievement and their proficiency in teaching skills.

Nimavathi, Gnanadevan G. (2009) made an effort to develop study habits through a multimedia program. The aim of this study was to find out the impact of multimedia on the development of the study habits of the secondary school students. The sample consisted of secondary school students of ninth standard. The pre-test and post-test equivalent group design was followed for this study. The data was subjected to descriptive and differential analysis. The tools used were the multimedia program developed by the investigator for teaching biology topics included in the IX Standard science syllabus and the Study Habit Inventory standardized by B.V Patel was used to assess the study habits of the secondary students. The findings of the studied revealed that there was a significant difference between the mean study habits scores of the pre-test and the post-test for the experimental group. The study proved that the students learning with the help of multimedia fared better in their study habits than the students learning through the conventional method.

Anbucarassy, B. (2010) conducted a study on the effectiveness of multimedia in teaching biological science to the IX standard students. The study was undertaken to find out the effectiveness of multimedia approach over the conventional method in teaching biology to the IX standard students. The research method used in this study was an experimental method with parallel group design. In the parallel group design, two or more groups were selected and their mean and standard deviation of some selected variables were equated. One group was treated as the control group and the other as the experimental group. Experimental factors were applied on the experimental group and traditional
teaching was given to the control group, simultaneously. A pre-test and post test was conducted for the control group and experimental group. The total sample consisted of 80 students studying in IX standard from Jeevanandham Govt. Hr. Sec. School and it was done through random sampling procedure. The students of the experimental group were given one month training in the selected lessons through multimedia. For the control group, the same lessons were taught through the traditional method.

The tools used were the pre-test on the selected topic developed by the investigator, the multimedia package to teach the experimental group, and achievement on the selected topic developed by the investigator. The major finding revealed that there is a significant difference in the achievement of the experimental group over the control group of ninth standard students in biology due to the exposure of multimedia-based learning to the experimental group.

Aravindan, S. and Ramaganesh, E. (2010) investigated the effectiveness of e-content in concretizing the concepts of physics among the heterogeneous teacher educators. The study explored the effectiveness of e-content in concretizing concepts in physics among the heterogeneous group, the prospective teacher educators of Department of Education, BARD, and Trichy. The E-content was developed on the topic “Semiconductors”. The study adopted the single group experimental design with a sample of 33 students in the Department of Educational Technology. The results revealed that the e-content was effective in concretizing the concepts of physics, even to the students with no science background at the collegiate level.

Ramasamy, R., and Hariharakrishnan, V. (2010) developed an e-content on “laser” in physics at the college level. The experiment was conducted with the developed modules of subject-content material on laser with a sample of 20 students of the UG level belonging to physics. The e-content on laser is a 10
minutes programme. The students were taught the developed e-content on laser. An achievement test consisting of 15 objective type items on the topic laser was administered. The experiment was conducted to establish the validity of the developed e-content with the content experts and user satisfaction on learning. The collected data subjected to appropriate statistical analysis, revealed that e-content is certainly effective in teaching this topic. The quality of the subject content material is in the hands of digital convergence of texts, graphics, animation, music, video, audio, etc. The achievement test score shows more than 80% in its average. Thus, this study proves the effectiveness of the e-content programme delivered to the college level students and also proves that it is helpful to attain an optimum level in their study.

**Angadi, G.R. (2010)** developed a multimedia package in biology. Developing and validating the multimedia presentation is a highly promising instructional technique. The investigator developed and validated the topic ‘The Living World’ in Bio-science of IX Standard, in the syllabus prescribed by the DSERT of Karnataka State. The pre-test, post-test equivalent group experimental design was adopted. It is found that the multimedia instruction was effective as comprehension and retention of information for longer duration compared to the conventional method of teaching.

**Girija. N. Srinivasalu, & Vijayalakshmi S. (2010)** made an experimental study on the effectiveness of computer multimedia package [SLM] on achievement in social sciences. The objectives of the study were to develop a multimedia package [SLM] to certain selected units of high school social science content and to study the effectiveness of multimedia package on the achievement of eleventh standard students in social science. The study included both boys and girls with the sample of 104 students of eleventh standard. Both the groups were equated on the basis of their pre-test scores on Intelligence. The tools used were (i) the standard Ravan progressive Matrix [RPM]
used to estimate the intelligence percentile of the two groups. ii) To the experimental groups, the reaction questionnaire was administered and the scores were measured, and (iii) the investigator prepared a multimedia package according to the level of the students. The experimental study was adopted to find the effectiveness of the multimedia package. T-test and percentage analyzes were the statistical technique used in the present study. Findings of the study revealed that superior performance of experimental group over traditional group suggested that SLM was found effective.

_Nisha Raninga (2010)_ has studied the effectiveness of CAI for the Teaching of Mathematics of Standard VII. In the present study, an attempt was made to compare the effectiveness of the CAI method and the traditional method of teaching the “Mean, Median, and Mode” unit of mathematics for class VII. A total of 66 students from the class VII of a Gujarati medium higher secondary. L.B.S school, in Rajkot were chosen as a sample. After every experiment, an achievement-test was administered and the results were evaluated and analyzed by considering appropriate statistical measures like mean, standard deviation (SD), and t-value. The analysis reveals that the t-value was significant in the case of the experimental group. So, the researcher rejected the null hypothesis and concluded that the CAI method was effective for teaching mathematics to the class VII students when compared to the traditional method.

_Tharvin sumi, I. & Edward William Benjamin. A. (2011)_ found the effectiveness of multimedia in teaching of physics for XI Standard students in the Puducherry region. The main objectives of the study were to study the effectiveness of multimedia approach over the conventional method in teaching of physics for XI standard students. Fifty students from XI Standard were selected as a sample for the study. The tools used were the multimedia package to teach the experimental group, pre-test on the selected topic developed by the investigation, and achievement test on the selected topic. The statistics adopted were differential
analysis, mean, S.D, and ‘t’ test. The outcome of the study revealed that there was a significant difference in the achievement of the experimental group over the control group of the XI Standard students in physics. Thus multimedia helped students to withstand their interest and also their retention power than the traditional method of teaching.

Amutha, S. (2011) investigated the effectiveness of designing e-content with a metacognitive instructional design (model) on science teaching competence of the student-teachers in teacher education institutions. E-learning modules facilitate the student-teachers of science on how to write a script and story board for the development of e-content of their own. Indeed the modules help them to learn the what, why, and how of e-content. This e-content was the first of its kind which is programmed for the student-teachers of science to learn an innovative teaching technique for teaching science concepts using meta-cognitive instructional design.

Rajula Shanthy.T (2011) conducted a study on Interactive MULTIMEDIA Instruction Versus Traditional Training Programmes: Analysis of their Effectiveness and Perception. In this study, the practicability of introduction of computer multimedia as an educational tool was compared with the traditional approach for training sugarcane growers in ratoon management practices in three villages of Tamil Nadu state, India, using pre-test, post-test control group experimental design. A CD-ROM was developed as a multimedia resource to support the training process using Macromedia Flash as the author ware. Three modes of message delivery-traditional lecture alone, lecture followed by multimedia and multimedia alone were analyzed for their effectiveness in terms of knowledge gain, learning index and extent of adoption.

The group which was exposed to lecture followed by multimedia had better knowledge gain and learning index. Farmers perceived that the use of different
multimedia building blocks made it an interesting and educative tool. The message, when given through lecture alone was perceived as boring and monotonous with limited attention span. The extent of adoption of ratoon management practices was almost on par; however the group which had received instructions through lecture followed by computer multimedia had a better adoption rate. Such a comparative analysis is an opportunity for a better understanding of the role that multimedia could play in technology transfer to the farmers.

Rossafri Mohamad (2012) conducted a study on the design, development and evaluation of an adaptive multimedia learning environment courseware among the history teachers. The teachers were allowed total control over the content of the courseware in terms of data input, audio-video, graphic, images, quiz etc compared to the “Ready to Use” courseware which does not allow room for the amendment or modification of the prescript content. The analysis of data was based on gender, age, computing ability, teaching experience and graduate and ‘non-graduate teachers’ perceptions, the mean values for aspects such as i) technical aspects; ii) interface design; iii) multimedia features; and iv) instructional design. Although it was still at the prototype stage, the overall mean computed for this course ware stood at a high value. The data for the study was collected from 85 teachers who were selected randomly. These teachers taught history in the secondary schools and were from different demographics. Descriptive statistical analysis was used to compute the mean values of the strengths and weaknesses of the courseware that were measured via a Likert-style instrument.

The findings, were based on the variables such as gender, age group, level of computer skills, teaching experience, and teacher category (graduate or non-graduate). The data showed that both the male and female teachers had similar perceptions on three of the aspects, namely interface, multimedia and instructional
design. However, for the technical aspects, the male teachers had a higher mean value compared to the female teachers.

*Sujit Pal, Sibananda sana and Asis Kumar Ghosh (2012)* studied the influence of interactive Multimedia Courseware: a Case Study among the Students of Physical Science of Class VIII. For this purpose a computer assisted multimedia courseware was developed with the help of Adobe Flash and Bangla Word on a single unit of Physical Science Curriculum of class-VIII under WBBSE (Bengali medium). Then two equivalent groups of class-VIII students (experimental and control) were selected. The sample size was taken as 50 students for each group to get comparable result. One group was exposed to the multimedia courseware while the other was not.

The performance of both the groups was then compared statistically (using t-test and ANOVA) after administering the self prepared standardized achievement test. The observed t value is 16.068 which is higher than the critical value at 1% level of significance (df=49). The ANOVA test also provided significant difference between experimental and control group. So statistically it can be concluded that the computer assisted multimedia courseware facilitate students’ learning in Physical science better than the traditional chalk and talk method.

*Jeya Shanmugaraja, Karthikeyan . K and Jayaraman . K (2012)* conducted a Study of effectiveness of e-content on teaching zoology at the higher secondary level. The investigator constructed and validated e-content in Zoology. The investigator found out whether there exists a significant difference between the lecture method of teaching and the teaching through e-content in Zoology to the XI standard students in Virudhunagar District. The data collected from the XI Standard students were analyzed by using the mean standard deviation, t-test. The
results of the present study revealed that the performance of teaching through e-content is better than the Lecture method in achievement.

Sadaghiani, Homeyra R.(2012) studied the impact of using multimedia learning modules (MLM) on the learning of the students enrolled in introductory physics courses at California State Polytechnic University, Pomona. One hundred and fifty-nine students were randomly registered in two sections of an introductory mechanics course, one of which featured the MLMs. Both sections had the same instructor, participated in class discussions on identical topics, and used the same problem-solving examples. The students in the multimedia group outperformed the students who did not experience the MLMs in a final course examination and across identical discussion questions.

Upasana Singh (2013) attempted to find out the state of technology integration in the teacher education institutions and schools of Patna in the State of Bihar, India that have the state of the art technology status. A sample of 150 pre-service and 64 in-service teachers was drawn for this purpose by purposive cum incidental sampling technique. The researcher studied the availability and accessibility of technology in the selected schools and the teacher education institutions: the relationship between technology proficiency of the pre-service and in-service teachers and their attitude towards integrating technology in education; and the relationship between the frequency of faculty usage of technology in the classroom instruction and the attitude of the pre-service teachers towards technology integration.

The outcome of the research is that the teacher education institutions are making efforts to use technology in the teaching-learning while schools still follow the traditional method. However, the situation is far from attaining technology integration in the educational practices. There is significant relationship between the proficiency of in-service teachers and their attitude
towards technology integration and between the frequency of faculty usage of technology in classroom instruction and the attitude of pre-service teachers towards technology integration.

Denisia. S.P. and Suresh John Kennedy. A.(2013) studied the effect of Computer Assisted Instruction (CAI) in teaching Chemistry for the Higher Secondary Students. In this study, three groups of students had been taken for the experimental studies. Each group consisted of 40 students in total 120 students were taken as samples for a period of six months for teaching chemistry in the schools of Tenkasi, Tirunelveli through Computer Assisted Instruction to Experimental group I & II and a Control group. The control group was taught with conventional teaching method and the other two groups with CAI software package with discussion and without discussion. As this was the first attempt in deploying CAI in teaching chemistry concepts in the schools, it was primarily employed as an educational means of teaching with CAI.

This study highlights a personal experience and a case study of implementing Computer Assisted Instruction and the effect it has on students’ performance in the course. Through hypotheses testing, it is clearly understood that employing Computer Assisted Instruction in the educational settings proves to have significant effect on student’s performance.

Suman Chhabra and Neelam Dhamija (2013) studied Computer Assisted Instruction Technique (CAI) in comparison to Conventional Teaching (CT) on the achievement of pupil teachers in the methods of teaching the English language. In this study, an instructional material was developed and validated by the researcher for both methods of instruction i.e., CAI as well as for Conventional Teaching (CT). The experiment was carried out involving 70 pupil teachers of B.Ed., class of a College of Education in Panipet. Pre-test – Post test Control Group design was used. In this study, two types of tools viz., Instructional Tools
(Software Packages for CAI, Lesson plan for conventional teaching) and Measuring Tools (Criterion Reference Tests (CRTS) and Raven’s Standard Progressive Matrices) were used.

The results of the experiment showed that CAI was found effective in terms of the achievement of the pupil teachers in the methods of teaching the English language at the post-test stage. However, no significant difference was found between the experimental group and control group at the pre-test stage.

Pratibha Sharma (2013) studied the role of interactive multimedia for enhancing students’ achievement and retention among the VII standard students by means of experimental study to compare the effectiveness of interactive multimedia and conventional direct method of teaching English with 50 students each in control group and experimental group.

The study concluded that both the methods taken for study were quite effective for teaching the English language to class VII students but however, out of these two methods, the interactive multimedia method was found more suitable with respect to the marks achieved by them in English. When the students were taught through, both direct conventional method and interactive multimedia method, it was found that the acquired retention was better in case of interactive multimedia method.

Diskshit, Jyotsna; Garg, Suresh and Panda, Santhosh (2013) made a comparative study on the pedagogic effectiveness of printed self-learning text with face-to-face tutorial support, interactive multimedia CD-ROM and online learning in an introductory computing module at the certificate level offered at Indira Gandhi National Open University (IGNOU), India. The study was based on an analysis of the existing instructional practices in the open universities in India in respect of difficulties faced, learner preferences, quality of support structure and services, mode of interaction, instructional and technological ingredients for
success in learning. Both descriptive as well as experimental research methods were used. A web server was established for use in the experiment with the students. An achievement test and a Response to Learning Activity Scale were developed and administered on the three groups of learners. The study reports that the use of interactive multimedia CD-ROM was found pedagogically more effective with a variety of learning activities than that presented through print with face-to-face support and that presented through the web with online learner support.

2.5 STUDIES RELATED TO CAI, MULTIMEDIA PACKAGES AND E-CONTENT IN MATHEMATICS- ABROAD

SoederKathy, I. (2001) made a study on the effect of computer-aided instruction on mathematics achievements. The objective of the study was to find the effect of computer-aided instruction on the mathematics achievement. Two groups of middle school students were studied to determine if computer assisted mathematics instruction increased student achievement as measured by the Pennsylvania System of School Assessment (PSSA) test. The groups of students were chosen from a single district. The first group used a computer-assisted mathematics instructional program for three years; the second group did not use any new technology. The mean test scores were calculated and compared. The findings of the study revealed that there was no measurable improvement by the students who used computer-assisted instruction.

Cannon. T.R (2005) carried out a study of Computer-based Instruction versus lecture base instruction in developmental Mathematics at a Tennessee Community College and also to examine achievement, retention, persistence and success of the students who began in elementary algebra, progressed into Intermediate Algebra and subsequently obtained their goal of completing an initial
college level Mathematics course. Two groups of elementary algebra from Chattanooga State Technical Community College were used in this study.

The study revealed that when examining the achievement, retention, persistence and success, in the area of his study, it showed a significant difference among the achievement rates. The lecture students’ achievement rates were significantly higher than the students who received computerized instruction. Retention, persistence and success did not show any significant difference between the two groups.

**Ortega-Tudela, J.M., and Gomez-Ariza, C.J. (2006),** in their study aimed to explore the extent to which computer-assisted teaching facilitates the learning of the basic mathematical concepts and skills in children with Down Syndrome (DS). The effectiveness of a multimedia teaching method is compared with a traditional one in the teaching of counting and cardinality abilities and concepts. In this study, two groups of DS children were trained. One of them was taught by using mathematical multimedia software, whereas the other learned by means of pencil-paper-based tasks on the same material as the multimedia group. The children of both the groups were evaluated before and after the training sessions. The multimedia group showed a higher performance than the paper and pencil-assisted teaching group on a variety of tasks and measures, suggesting a clear relation between the teaching method and the mathematical learning in DS children.

**Gabriel Lopez-Morteo and Gilberto Lopez (2007)** introduced an electronic collaborative learning environment based on Interactive Instructors of Recreational Mathematics (IIRM), establishing an alternative approach for motivating the students towards mathematics. The IIRM are educational software components, specializing in mathematical concepts, presented through recreational mathematics, conceived as interactive, recreation-oriented learning objects,
integrated within the environment. The architecture of the learning environment which integrates communication services that support the interaction process of the learning community, through instant messaging, chat rooms, and multi-player math games were presented. Through the environment’s interface of their personal workspace, the students have access to several easy-to-use mechanisms that allow them to customize its content, layout and appearance. At internal levels, the functionality of IIRM is enhanced with features supported by the environment infrastructure. The different aspects of the learning environment in three short, motivation-oriented math courses given to Mexican high-school students were evaluated. The results indicated that the use of the IIRM-based electronic learning environment, positively affects the student attitudes towards mathematics.

Behnoodi. M, Moriyam. J (2007) developed an interactive web resources for the high school mathematics, concentrating on Geometry, based on the results of previous surveys (M.Behnoodi, J.Moriyama ATCM 2006). They designed the web resources in eight types of categories. Utilising video conference, this web site taught 38 first-grade high school students in a city of Japan. Online pre-testing and post-testing was used to evaluate the motivation for mathematics learning and to survey the usability, eagerness and motivation of the students.

The results demonstrated that explanation and site structure had a significant positive impact on motivation. Further, although multimedia did not have a substantial impact on students’ level of satisfaction, the effectiveness of multimedia design in changing the students’ eagerness for usage of ICT was considerable. In light of these results, it is suggested to find the characteristics of visualizing in multimedia to make a meaningful relationship between multimedia and learning.
**Yahya, Faridah Hanim (2008)** conducted a Study on the Development of interactive multimedia courseware using Problem Based Learning for mathematics form 4 (PBL MathS-Set)

A study had been conducted to investigate the students’ attitude towards the usage of interactive multimedia courseware using Problem Based Learning (PBL Maths-Set) approach for Set topic in form Four mathematics syllabus. A total of 25 students from one of the technical schools in Selangor, Malaysia, took part in this study. This courseware presents an authentic scenario which is more challenging and demand students to come out with a project work report apart from learning about the concepts of Set. The students were assigned to a heterogeneous ability group based on the reasoning abilities scores in Lawson Reasoning and Scientific Test (LRST). Each group consisted of Hypothetical Deductive (HD) reasoners and Empirical Inductive (EI) reasoners. This paper includes a report of a usability test which used a five point Likert scale. The finding indicated that the students showed positive perceptions towards the usage of the courseware in their learning.

**James A. Maher (2008)** conducted a quantitative, quasi-experimental study to determine if there was a measurable difference in the achievement on the mathematics section of the state test for the students (n=121) from a middle school in New Jersey who received computer-assisted instruction (CAI) in drill and practice computation related to the eighth grade mathematics curriculum standards compared to the students (n=163) who did not receive the CAI.

The results suggest that the CAI intervention did not improve the student achievement significantly (p>.05). In two categories, the students who received the CAI performed significantly lower than their peers in the comparison group. Students in the control group who had scored in the 25th percentile on the seventh grade CTB/McGraw Hill Terra Nova pretest outperformed their peers in the
treatment group on the New Jersey Grade Eight Proficiency Assessment (GEPA) mathematics section. Likewise, the Asian students in the control group outperformed all other students in the treatment and control groups. The results fit within the existing knowledge on the subject of computer-assisted instruction and add support to the idea that the practitioners should evaluate curriculum and instruction interventions for demonstrated for success before they bring them into the learning environment.

Nor Azan Mat Zin (2009) prepared “A Math’s Multimedia Courseware for Effective Mathematic Learning: Matching Instructions to the Student’s Learning Style”. The usability study on the courseware was a case study involving 35 from the Form I secondary school students, using the quasi experimental pre and post-tests approach, observation as well as survey questionnaire.

The findings indicated that the samples using the matching A-Math’s modules showed a significant rise in their post-test achievement. This experimental group obtained a significant mean gain score of 10.5 compared to the low mean gain score of 1.8 for the mismatched group. The results from the study indicated that matching students’ learning styles to instruction using A-Maths multimedia courseware is effective in enhancing student’s learning gains.

Diane Pedrotty Bryant (2009) carried out a meta-study of computer-assisted instruction (CAI) studies in mathematics for the students with learning disabilities (LD) focusing on examining the effects of CAI on the mathematics performance of students with LD. This study examined a total of 11 mathematics CAI studies, which met the study selection criterion, for the students with LD at the elementary and secondary levels and analyzed them in terms of their comparability and effect sizes.
Overall, this study found that those who did CAI studies did not show conclusive effectiveness with relatively large effect sizes. The methodological problems in the CAI studies limit an accurate validation of the CAI’s effectiveness. Implications for future mathematics CAI studies were discussed.

**Hassan, F., Dahalan, N. and Zakaria, Z. (2009)** conducted a Study on Developing and Evaluating Rapid E-learning Mathematics Materials for the Distance Learners

Rapid e-learning authoring tool has made the development of e-learning materials much easier for the teachers. This exploratory study was designed to evaluate the mathematics e-learning material developed using Articulate Presenter. Using Keller's model of motivation, a questionnaire was designed and distributed to 20 respondents. The mean analysis was carried out to assess the respondents' perception of mathematics e-learning materials. This study suggests that the respondents perceived that the mathematics e-learning materials create confidence in learning. The practical implications of these findings were discussed.

**Mohammad Hafiz et.al., (2010)** carried out a study on Introductory Mental Arithmetic using Interactive Multimedia for the Pre-School Children. Arithmetic is an important skill to learn at an early age. However, teaching arithmetic to the pre-school children can be challenging as the children around that age have short attention span and prefer to engage in interactive activities. Thus, the purpose of this study was to incorporate multimedia elements into mathematical learning to make it more interactive and exciting to the children. The contents had been specifically designed to visualize the introduction of numbers and to encourage children’s interaction by drawing their attention to the courseware.

The result revealed that the students have shown significant improvement over the mental arithmetic approach after being subjected to a typical classroom
test. This concludes that the mental arithmetic using interactive multimedia could enhance learning experience for pre-school children.

_Baptista, J. Aires, et al. (2010)_ took up a case-study on “Using Information Technology-Based Exercises in Primary Mathematics Teaching of Children with Cerebral Palsy and Mental Retardation: a Case Study”. They presented a case study where a set of multimedia exercise were used in order to possibly improve the mathematical skills of the pupils, one with mental retardation and another with cerebral palsy. Being part of a Web-based system to support students’ learning, the referred set of multimedia exercises proved to be the children’s favourite, rather than exercises in paper form, which also led the children to show a fair more positive attitude towards learning. Also, it was observed that through the mentioned multimedia exercises, the children became far more autonomous, interested, persistent, happy, and able to easily absorb the material, as well as more willingly to continue on working.

_Tutut Herawan (2010)_ studied the Effect of Using an Interactive Multimedia Courseware within a Collaborative Learning Environment on the Learning of Pre-Algebra Concepts among the Pre-University Engineering Students. To enhance the effectiveness of the teaching and learning efforts, a blended teaching and learning method (CDiCL) where a specifically designed courseware based on the Herman Brain Dominance theory was used within a collaborative learning environment. The courseware provides opportunities for individually paced drill and practice while the collaborative learning environment provided opportunities for social learning support from peers.

The study compared the CDiCL method to three other methods namely using the courseware only (CD), using collaborative method only (CL) and using the conventional method. We found out that the CDiCL group performs similarly
to the CD group but was superior to the CL group. Affective factors like attitude and motivation played major roles towards this outcome.


Students enrolled into an engineering programme are expected to have good grasps of mathematical concepts and procedures as mastery of mathematics is essential to succeed in the engineering based programmes. However, many new engineering students do not possess adequate mathematical skills and as a consequence, the engineering teachers often have to spend time on remedial work in the first two semesters of the programme which is counter productive for all. Even with remediation, the outcome is not always satisfactory. To enhance the effectiveness of our teaching and learning efforts, they tested the use of a blended teaching and learning method (CDiCL) where a specifically designed courseware based on the Herman Brain Dominance theory was used within a collaborative learning environment. The courseware provides opportunities for individually paced drill and practice while the collaborative learning environment provided opportunities for social learning support from the peers. They compared the CDiCL method to three other methods, namely using the courseware only (CD), using collaborative method only (CL) and using the conventional method. They found out that the CDiCL group performs similarly to the CD group but were superior to the CL group. Affective factors like attitude and motivation played major roles towards this outcome.

Josefina Barnachea Janier, et. al., (2010) developed an interactive courseware in the application of integration (areas and volumes) and was adapted as a technological innovation in tutoring engineering students in Calculus. The
courseware was composed of six modules where the topics were part of the course content in the Engineering Math-Calculus, a course offered in the Foundation Programme of University Teknologi PETRONAS. Fifty students participated in the study and divided into two groups, the control and the experimental group.

The results showed that the students in the experimental group performed better than the students in the control group. This indicates that the interactive courseware is a useful tutoring tool to enhance student’s learning the application of integration and it can be used for independent study.

**Alday, R. and Panaligan, A. (2010)** conducted a study at the undergraduate level to determine the effects of E-learning, particularly; in analytic geometry as to if it can lessen the common fear of Filipino students to mathematics. Just because teen age students engross themselves with the use of technology specifically computers, this study investigates that if math anxiety would be lessened if mathematics is taught using E-learning, thus improving student academic performance.

**Norrgainy Mohd Tawil, et al. (2011)** researched the topic, “E-learning versus Traditional Method in Teaching Mathematics and Statistics Courses for the Engineering Students in University Kebangsaan Malaysia. In this study, they examined the students’ perception towards the importance and usefulness of modern technologies, such as E-learning (WILEY PLUS) in comparison with the more traditional lecture, as knowledge delivery or alternatively, a method of learning process. The objectives of this study were to test whether there is any difference between these two methods and to identify which method is more important and agreeable to the students. The sample of this study consisted of First Year and Second Year engineering students at the Faculty of Engineering and Built Environment, UKM who had Mathematics and Statistics courses, respectively. The paired t-test was used to compare these two methods. This
study revealed that there is a significant difference between WILEY PLUS and lecturing in Mathematics and Statistics courses. Overall, lecturing was significantly of importance and favourable in the learning process for both courses compared to the newly-introduced WILEY PLUS.

_Tzu-Hua Wang (2011)_ studied the implementation of Web-based dynamic assessment in facilitating the junior high school students to learn mathematics. This research adopted the Graduated Prompting Assessment Module of the WATA system (GPAM-WATA) and applied it to the remedial teaching of junior high school mathematics. In GPAM-WATA, when the examinees fail to answer items correctly, they obtain instructional prompts (IPs) in a graduated way. A quasi-experimental design was adopted. Ninety-six junior high school seventh graders from three different classes participated in this research. The three classes were randomly divided into the GPAM-WATA group \((n=31)\), the N-WBT group \((n=31)\), and the PPT group \((n=34)\). All the students received traditional mathematics instruction from the same teacher. After the traditional mathematics instruction, all the students took the pre-test of the summative assessment. The students in the three different groups, then, respectively received remedial teaching in the form of GPAM-WATA, normal Web-based test (N-WBT), and paper-and-pencil test (PPT). After the remedial teaching, all the students took the post-test of the summative assessment. The results indicate that compared with other groups, performing remedial teaching using GPAM-WATA has significantly better effectiveness. Moreover, it is found that the IPs in GPAM-WATA are effective in the remedial teaching not only for those students most lacking in different types of mathematical problem-solving knowledge but also all the other students.

_Meagher, Mechael; Ozgun-Koca, Aslil and Edwards, Michael Todd (2011)_ conducted a study on Pre-service Teachers’ Experiences with Advanced
Digital Technologies: The interplay between Technology in a Pre-service Classroom and in Field Placements. This paper reports on a study of 22 pre-service teachers enrolled in a first-semester mathematics teaching methods course. The course activities included participation in two separate field experiences in the neighbouring school districts. The methods placed considerable emphasis on the use of advanced digital technologies in the teaching and learning of mathematics, with particularly extensive use of the TI-Nspire. The purpose of the study was to examine pre-service teachers’ evolving relationships with advanced digital technologies in their teaching, examined through the lens of their technological pedagogical content knowledge (Koehler & Mishra, 2005; Niess 2005 2006, 2007), and to examine the interplay between their field placements and the quality of their use of advanced digital technologies in the inquiry-based lessons. The principal conclusion of the study is that there seems to be a crucial, perhaps decisive effects that modelling of exemplary practice in the field placement has no candidate attitudes regarding the use of advanced digital technologies in their teaching. There is evidence that the pre-service teachers’ experiences in the classroom primed them for the possibilities of technology use but it takes the experiencing of exemplary practice to convince them of the benefits of working to incorporate technology in their own teaching.

*Malik, Ishan. Z (2011)*, Studied the effects of multimedia-based instructional technology on African American ninth grade students’ mastery of algebra concepts. The purpose of this quantitative study using a quasi-experimental design was to determine whether the use of multimedia-based instructional technology had effect on urban African American ninth grade students’ mastery of algebra concepts. A pre-test and post-test of algebra concepts comparing the results from the treatment group taught with an interactive whiteboard and the comparison group without any multimedia-based instructional technology occurred in this study. One hundred thirty seven African American
ninth grade students enrolled in Mathematics in an urban high school in Atlanta, Georgia participated in the study. The students’ post-test scores was the dependent variable, the independent variables were the integration of multimedia-based instructional technology and gender, and pre-test scores was used as the covariate.

The post-test scores were significantly different from the treatment group and the comparison group in the student’s mastery of algebra concepts when using the multimedia-based instructional technology, specifically an interactive whiteboard. A difference did not exist between the females and males mastery of the algebra concepts when using the multimedia-based instructional technology.

_Takaci, Durdica (2011)_ carried out a study on Multimedia approach in teaching mathematics- example of lesson about the definite integral application for determining an area. This study presents the importance of using multimedia in the math classes by an example of multimedia lesson about definite integral and the results of the research carried out among the students of the first years of faculty was divided into two group of 25. One group had the traditional lecture about the definite integral, while the other one had the multimedia method. The main information source in the multimedia lectures was the software created in Macromedia Flash, with definitions, theorems, examples, tasks as well as in traditional lectures but with emphasized visualization possibilities, animations illustrations, etc.

Both the groups were tested after the lectures. Students from the multimedia group showed better theoretical, practical and visual knowledge. Besides that survey carried out at the end of this research clearly showed that the students from the multimedia group were highly interested in this way of learning.

_Lokar, Matija (2011)_ conducted a Study on Development of E-Content for Teaching Mathematics.
As stated in numerous papers, teachers of the 21st century should be primarily oriented towards guiding the students through the learning process. In this process information and communication technology (ICT) plays a significant role and more and more e-resources are available. But analysis of the existing resources often reveals that their authors do not use the opportunities offered by the new technologies. All the e-resources are monolithic blocks. This demands that the teacher takes them as a whole, precisely in the order they were written in. Many resource authors namely forget (or neglect the fact) that most of those resources are used with a teacher as the students' guide. Teachers are the ones who should personalize the content towards a specific student's needs and towards the didactical situation in question. Therefore, resources should be prepared so that they can be easily adapted. The selection of proper technologies and tools for managing e-learning content, for creating and modifying e-learning content, is essential to ensure basic support and popularization of e-learning. This paper, presents guidelines for preparing e-materials based on the idea of a "modular, interactive e-content" concept, using open-source solutions and open standards as well as some projects where e-materials have been prepared primarily in the terms of ease of adaptation, modification and guidance provided for the target group.

Cheung, A and Slavin, R. E. (2011) studied the effectiveness of Educational Technology Applications for Enhancing Mathematics Achievement in the K-12 Classrooms. In this study, after applying consistent inclusion standards, a total of 74 studies met the inclusion criteria and were included in the final review. The studies were divided into elementary (N=45) and secondary (N=29) schools. The effect size for the elementary (ES=+0.17) was higher than that of the secondary (ES=+0.14). The three major categories of education technology reviewed were computer managed learning, Comprehensive models, Supplemental CAI technology.
Findings of this review suggest that the educational technology applications produce a positive but small effect (ES=+0.16) on mathematics achievement. Supplemental CAI technology had the largest effect, with an effect size of +0.19. The other two categories, computer-managed learning and comprehensive models, had much smaller effect sizes, +0.09 and +0.06, respectively. Educational technology is making a modest difference in mathematics learning. The evidence to date, however, does not support complacency. New and better tools are needed to harness the power of technology to enhance mathematics achievement for all children.

*Hui-Chuan Chu, et. al, (2011)*, did a research on learning case adaptation for problem-oriented E-learning on mathematics teaching for students with mild disabilities. Both the problem-oriented learning and case-based learning are effective methods for practical knowledge development. However, an automatic development of learning cases for adaptive learning is still an open issue. To support adaptive case-based learning in a proposed problem-oriented E-learning (POeL) environment and to address the complexity and diversity of the learning problems of the students with mild disabilities, this study presents a learning case adaptation framework to support problem-oriented E-learning. This framework provides mechanisms to search and match similar learning cases according to encountered teaching problems by information retrieval techniques, and to develop an adaptive learning case by adaptation techniques. Adaptation techniques include a substitution technique, a removal technique, and a composition technique, and utilize cosine-measure and genetic algorithm. In this research, adaptive learning cases were developed for teaching the students with mild disabilities so as to assist regular and special education teachers to develop practical knowledge of teaching more effectively.

*Syazwan Noordin Wan Fatimah and Wan Ahmad (2011)* developed a multimedia courseware based on the framework that utilizes van Hiele’s
Geometric model for visualizing 3D models. The tools used for developing the courseware were 3DS Max7 and Macromedia Director MX. A conceptual framework was developed based on the van Hiele’s model. In order to gauge the effectiveness of the courseware as an aid for visualizing 3D models, a testing was conducted with 60 high school students aged 14 years old. The groups were divided into control and experimental. The results concluded that the students had demonstrated the ability to visualize and enhance their understanding on the topic after using the courseware.

*Maria Andrade-Arechiga*, *Gilberto Lopez*, and *Gabriel Lopez-Morteo* (2012) attempted a research on Assessing effectiveness of the learning units under the teaching unit modelling and undergraduate mathematics course. An interactive platform for Learning Calculus (PIAC) that serves as a container for the Learning Units (LU) was created following a specific instructional design, namely, the Teaching Unit Model (TUM), and presented. Two experimental groups and two control groups for a total of 102 students taking the Calculus course participated in the study. The results indicated that the grades obtained in all academic activities by the groups using PIAC, compared with the control groups, provide solid evidence to the positive influence of the intervention of the technology under the TUM.

*Falguni S. Vansia* (2012) conducted a study on Development and Effectiveness of Computer Based Learning Programme in Teaching Mathematics for the students of standard IX Gujarati medium secondary school in Navsari district. Multi-staged sampling technique was used by the researcher in this study. In each School the experimental and traditional both groups and each group consisted 20 boys and 20 girls students. The total sample for the experiment consisted of 160 students. The true experimental design ‘pretest-post test control group’ was employed for this study. The data were analyzed through the statistical techniques such as ANCOVA.
The findings of the study states that 1. Mathematics teaching through CBL programme was comparatively better than traditional method in terms of the achievement of the students. 2. Mathematics teaching effect on boys and girls was different. The boys were taught better than the girls students. 3. Effectiveness of teaching method on the achievement scores of the students of post-test was same for both genders.

Aleksandar Milajic et.al., (2013) studied on application of interactive multimedia tools in teaching mathematics-examples of lessons from geometry. This study presents the benefits and importance of using multimedia in the math classes by the selected examples of multimedia lessons from geometry (isometric transformations and regular polyhedra). The research included two groups of 50 first year students of the Faculty of Architecture and the Faculty of Civil Construction Management. Each group was divided into two groups of 25 students, one of which had the traditional lectures, while the other one had the interactive multimedia lessons.

The main source of information in the multimedia lectures were the softwares created in Macromedia Flash, with the same definition, theorems, examples and tasks as well as in traditional lectures but with added emphasize on visualization possibilities. Animations, illustrations, etc. Both the groups were tested after the lectures. In both, multimedia groups students showed better theoretical, practical and visual knowledge. Besides that, the survey carried out at the end of the research clearly showed that the students from the multimedia groups were highly interested in this way of learning.


E-content learning package improved the learning process of the students in formal or informal setting. It allows them to sort out the information to analyse
and makes, meaning for conceptualization and applications which is suitable for individual learners. The objectives of the study was to measure the effectiveness of the E-content learning package in learning Mathematics for prospective teachers and the experimental research is essential for finding out the effective from the population of prospective teachers. The investigator selected 30 students from a college of education in Tamil Nadu. The tools used were E-content learning package for Mathematics prospective teachers developed by the investigator and pre-test in Mathematics developed by the investigator. In the experimental group, the students learnt the subject Mathematics by using this E-content learning package for Mathematics. The control group student teachers were taught using conventional method. The findings of the study showed that there was significant difference between pre-test and post-test scores for the experimental group in learning Mathematics. The experimental group Prospective Teachers achieved high in the post-test than the Pre-test. And also there was significant difference in the Post-test Scores of the experimental and control group. That is the experimental group Prospective Teachers achieved high in the post-test than the control group Prospective Teachers. The investigator concludes that the experimental group is more effective than the control group. Thus E-content learning package in Mathematics Education for the prospective teachers is more effective.

Liu. Y (2013) conducted a comparative study of Integrating Multimedia into the Third Grade Math Curriculum to Improve Math Learning. This quasi-experimental study was to design, develop, and implement one multimedia math lesson in third grade to improve students’ math learning. The non-equivalent control group design was used. The experimental group had 11 third grade students and the control group had 15 third grade students in an African American predominated elementary school in the mid west of USA. The independent
variable was the multimedia math lesson and the dependent variable was student’s math performance.

The findings of the study were:

a) the experimental group students scored favourably about the multimedia math lesson,

b) the experimental group students were very attentive to the multimedia math instruction and

c) The students scored statistically higher on the post-test at the end of the intervention in the experimental group than in the control group. The findings have theoretical and practical international implication for K-12 education.

James Ussher et. al., (2014) conducted a study on The Effectiveness of Interactive Multimedia Courseware as Instructional Medium for Teaching

This study looked at the comparative analysis of the performance of the pupils who were taught multiplication of fractions using interactive multimedia courseware and those who were taught using the traditional teaching model. Visual Basic.Net, Captivate and TechSmith Camtasia Studio v5.0.2 were used to develop the interactive multimedia courseware on multiplication of fractions. The research instrument was in the form of a teacher made test and questionnaire. The test consisted of pre-test and a post-test where the test items difficulty were paralleled. The simple random sampling method was used to select 72 primary five pupils (36 pupils each from the two primary five classes). Frequency, percentages, Chi-square and t-test were used for the Data analysis. The results showed that there was no significant difference in the performance of the experimental group and the control group, but there was significant difference in
the pupil’s interest in multiplication of fractions in the experimental group and the control group.

*Scott Freeman, et. al., (2014)* conducted a study on Active learning increases student performance in science, engineering, and mathematics. To test the hypothesis that lecturing maximizes learning and course performance, we metaanalyzed 225 studies that reported data on the examination scores or failure rates when comparing student performance in undergraduate science, technology, engineering, and mathematics (STEM) courses under traditional lecturing versus active learning. The effect sizes indicate that on average, the student performance on examinations and concept inventories increased by 0.47 SDs under active learning ($n = 158$ studies), and that the odds ratio for failing was 1.95 under traditional lecturing ($n = 67$ studies). These results indicate that the average examination scores improved by about 6% in the active learning sections, and that the students in classes with traditional lecturing were 1.5 times more likely to fail than were the students in classes with active learning. Heterogeneity analyses indicated that both the results hold across the STEM disciplines, that active learning increases scores on concept inventories more than on course examinations, and that active learning appears effective across all class sizes—although the greatest effects are in small ($n \leq 50$) classes. Trim and fill analyses and fail-safe $n$ calculations suggest that the results are not due to publication bias. The results also appear robust to variation in the methodological rigor of the included studies, based on the quality of controls over student quality and instructor identity. This is the largest and most comprehensive metaanalysis of undergraduate STEM education published to date. The results raise questions about the continued use of traditional lecturing as a control in research studies, and support the active learning as the preferred, empirically validated teaching practice in regular classrooms.
Kevin Mulqueeny, et. al., (2015) conducted a study on Incorporating effective e-learning principles to improve student engagement in the middle-school mathematics. The expanded use of online and blended learning programs in K-12 STEM education has led researchers to propose design principles for effective e-learning systems. Much of this research has focused on the impact on learning, but not how the instructional design impacts student engagement, which has a critical impact both on short-term learning and long-term outcomes. The Reasoning Mind has incorporated the e-learning principles of personalization, modality, and redundancy into the design of their next-generation blended learning platform for middle-school mathematics, named Genie 3. In three studies, we compare student engagement with the Genie 3 platform to its predecessor, Genie 2, and to traditional classroom instruction.

Study 1 found very high levels of student engagement with the Genie 2 platform, with 89% time on-task and 71% engaged concentration. Study 2 found that students using Genie 3 spent significantly more time in independent on-task behavior and less time off-task or engaged in on task conversation with peers than students using Genie 2. The Students using Genie 3 also showed more engaged concentration and less confusion. Study 3 found that the students using Genie 3 spent 93% of their time on-task, compared to 69% in traditional classrooms. They also showed more engaged concentration and less boredom and confusion. The Genie 3 students sustained their engagement for the entire class period, while engagement in the traditional classroom dropped off later in the class session. In both the study 2 and 3, Genie 3 students showed more growth from the pre- to post-test on an assessment of key concepts in sixth-grade mathematics.

The incorporation of evidence-based e-learning principles into the design of the Genie 3 platform resulted in higher levels of student engagement when compared to an earlier, well-established platform that lacked those principles, as well as when compared to traditional classroom instruction. Increased
personalization, the use of multiple modalities, and minimization of redundancy resulted in significant increases in time on-task and engaged concentration, but also a decrease in peer interaction. On the whole, this evidence suggests that capturing students’ attention, fostering deep learning, and minimizing cognitive load leads to improved engagement, and ultimately better educational outcomes.

2.6 STUDIES RELATED TO CAI, MULTIMEDIA PACKAGES AND E-CONTENT IN MATHEMATICS- INDIA

Jothikani. N and Thiagarajan A.P. (2004) studied on the effectiveness of Computer Assisted Instruction in Mathematics among the B.Sc., Degree students. The investigator taught the control group by conventional method and the experimental group was taught through CAI. ‘t’-test was applied in order to test the significance difference between the mean scores of pre test and post test of conventional and experimental group and to test the significance of CAI over conventional method for the mean gain scores of control and experimental groups.

The study concludes that there is no significant difference between the mean scores of the pre test for the control and experimental group 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. (ii) The mean scores of the 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 2001-2002. (iii) The mean gain scores of the control group were significantly greater than that of experimental group in all six units with reference to the objective and their level of achievement in both the years 1999-2000 and 2001-2002. Hence, it was concluded that the conventional method was more effective and efficient than the CAI method.
Rosales. J.S. (2005) described that the effect of a Computer Assisted Instruction program had on the Mathematics achievement of the IX grade high school students in the lower Rio Grande Valley as measured by the state assessment. A quasi experimental of the pre test post test control group design with matching was used. The experimental group utilized a commercially available Computer Assisted Instructional program in addition to instruction as described in the Academic Excellence Indicator System (AEIS) and according to instruction as District curriculum guidelines. The control group utilized only instruction as described in its Academic Excellence Indicator System (AEIS) and according to District curriculum guidelines, spring 2003. Eight grade Mathematics state assessment, and ANCOVA procedures were used to determine the statistical significance of the data.

There was a statistically significant difference between the Mathematics achievement of the IX grade high school students in the lower Rio Grande Valley who had participated in the Computer Assisted Instruction and the traditional instruction. The resultant analysis indicated that there was statistically significant difference between the Mathematics achievements of the two groups.

Lakshmi Narayanan. S (2011) studied the effectiveness of problem solving strategy in Mathematics at the higher secondary level by adopting pre-test post-test experimental design with 40 XI standard students of the Higher secondary school from Villupuram with the help of the developed package. The result reveals that there was a significant difference between the post test scores of the control group and the experimental group.

Pramila Ramani and Harsha Patadia (2012) conducted an experimental study on comparing the academic performance of the students of class VIII in one of the English Medium Schools of Vadodara, India among traditional instruction,
only Computer Assisted Instruction (CAI) and Computer Assisted Instruction with simultaneous discussion. The design used in this study was post test only control group design. Three sections of class VIII students were selected and the groups were randomly allotted. The experimental group A consisted of 28 students and experimental group B consisted of 24 students and the control group consisted of 21 students. The experimental group A studied through the developed CAI. The experimental group B studied through the developed CAI along with simultaneous discussions and the control group studied through traditional method. The students in all the groups learned the same topics viz. “Profit and Loss” and “Simple and Compound Interest” through the respective instructional strategy. The experiment time duration was 30 periods and each period consisted of 35 minutes in each group for one month.

ANCOVA was used in the data analysis. There was significant difference in the post test scores of the students receiving traditional method, only CAI and CAI with simultaneous discussion. It revealed that the traditional method is as effective as only CAI. CAI with simultaneous discussion is more effective than the traditional method. CAI with simultaneous discussion is more effective than only CAI.

Dhevakrishnan. R, et.al.,(2012) aimed at effectiveness of computer assisted instruction (CAI) in teaching of mathematics at the secondary level adopting experimental method and observed the difference between (CAI) and traditional method. A sample of sixty (60) students of IX class in VVB Matriculation Higher Secondary School at Elayampalayam, Namakkal district was selected for a sample. The experimental group consisted of 30 students who were taught ‘Mensuration’ by the computer assisted instruction and the control group comprising 30 students who were taught by the conventional method of teaching. The data was analyzed using mean, S.D. and t test.
The findings of the study clearly point out that there was significant increase in the mean gain scores that has been found in the post test scores of the experimental group. Significant differences had been found between the control group and the experimental group on post test gain scores. The experiment group, which was taught by the CAI showed better learning. The conclusion was evident that the CAI was an effective media of instruction for teaching Mathematics at secondary students.

Singh. J. D. (2013) made an attempt to analyze various issues and problems relating to the elementary teaching and learning of Mathematics. And he stressed the importance of appropriate technology that can bring about a shift from the content of mathematics to the processes of learning mathematics such as estimation, approximation, visualization, reasoning and problem solving. Also he addressed the suggestions for improving Teaching and Learning of Mathematics viz., Teachers should adopt different strategies and methods using multimedia, web, hands on etc. according to individual needs of the learners which help in inculcating interest in the subject.

Sajna Jaleel (2015) conducted a study on Effectiveness of E-content in Mathematics on Mathematical Thinking among Secondary School Students

Through the study, the investigator tried to analyze the effectiveness of e – Content in Mathematics on Mathematical Thinking among the Secondary School Students. The research works showed that it was possible to promote Mathematical Thinking in children by means of suitable techniques in teaching Mathematics by providing suitable teaching experiences. Hence, through the study, the investigator tried to find the effectiveness of e – Content in Mathematics on Mathematical Thinking among the Secondary School Students. The investigators adopted Experimental Method in the present study on a sample of 112 Secondary School Students taken at random. The study revealed that the e –
Content in Mathematics is effective over Activity Oriented Method on developing Mathematical Thinking of Students at the Secondary level.

The investigator analyzed the effectiveness of e – Content in Mathematics on Mathematical Thinking among the Secondary School Students over Activity Oriented Method. The study revealed that e – Content in Mathematics is more effective than Activity Oriented Method for developing Mathematical Thinking among the Secondary School Students. Hence the following implications are made based on this result. Learners should try to learn the complex mathematical concepts through e – Content in Mathematics. This method makes the learning of mathematics more flexible, easy and according to their level of Mathematical thinking. This method serves as a better instructional strategy for developing mathematical thinking skills. So the teachers should plan the teaching – learning activities according to the needs of the students. The curriculum planners and the educational administrators should include innovative methods like e – Content in the curriculum design for the effective implementation of the content.

2.7 STUDIES RELATED TO ATTITUDE TOWARDS E-CONTENT - ABROAD

Paul G.Paris (2004) carried out a research study to examine the affective, behavioural, and cognitive attitudes of 52, Year 10 students from an Adelaide Public Secondary School towards a specific type of online E-learning, that of Online Web-Assisted Learning (OWAL). The data were collected to examine differences in attitudes between paper assisted learning and OWAL, of differences in attitudes towards OWAL between males and females, the correlation between Internet use and positive OWAL attitudes, and the “publishing elements” that students find most appealing in OWAL.

Balarabe Yushau (2006) carried out a study that examines the influence of blended E-learning on students’ attitude towards mathematics and computers. A
random sample of 70 students of the preparatory year program of King Fahd University of Petroleum & Minerals (KFUPM), Dhahran served as the sample of this study. The data were collected at the beginning (pre-program) and the end (post-program) of the semester using Aiken Mathematics Attitude Scale and Greessen and Loyd Computer Attitude Scale. The result indicates that the subjects have positive attitude towards mathematics and computers.

Belinda Soo-Phing TEOH and Tse-Kian NEO (2007) conducted a Study on Interactive Multimedia Learning: Students’ Attitudes and Learning Impact in an Animation Course. Malaysian classrooms are progressively absorbing interactive multimedia as instructional strategies for teaching and learning. Though, till now, interactive multimedia in a Malaysian classroom is often limiting and is confined to the hybrid use of chalk-and-talk method with multimedia assisted materials, where learning is still largely teacher-oriented. Such progress does not realize the full potential of multimedia learning, thus denying the credibility of the student-centred learning strategies. The Web provides a wide network of information and interactive simulations necessary for active and independent learning. Hence, this paper describes the development and implementation of student-centred learning through Web-based domain on the students in a Film & Animation course. The aim is to determine students’ learning impact and attitudes towards independent learning and self-paced discovery. A set of multimedia tools were employed to create the student–centred learning environment and were designed using Gagne’s Nine Events of Instructions which provides a proper theoretical framework of a good instructional lesson plan. The essential features were documented, examined and its impact on the student learning process assessed. Students’ attitudes toward this Web learning approach were recorded as positive and promising. The use of multimedia in learning proves to be a feasible and viable alternative to traditional classrooms.
**Padilla, B. and Rodríguez, M.C. (2008),** presented a paper titled “Relationships between Affective Style, Attitude towards E-learning, and Effectiveness of an Online Training System”. The study focused on an online training system in a Mexican company. A convenience sample of approximately 20 students were used. Students’ affective style and attitude towards E-learning were measured through an electronic version of PANAS and an adaptation of Mishra and Panda’s E-learning Attitude Scale, respectively. These were related to the program’s effectiveness, which were evaluated through satisfaction and performance, in accordance with Kirkpatrick’s model. Positive, significant correlations between the variables were the outcome.

**Erlich, Zippy; Gadot, Rivka and Shahak, Daphna (2009)** studied the use of technologies as teaching aids tools for self-study influenced by students’ attitudes toward computers and their applications. The purpose of this study is to determine whether taking a Computer Literacy and Applications (CLA) course has an impact on students’ attitudes toward computer applications, across various undergraduate disciplines. A Computer Application Attitude (CAA) questionnaire was administered at the beginning and at the end of the semester to social science students enrolled in a CLA course. The study population was divided into two groups according to the students’ field of study: quantitative-oriented and qualitative-oriented. A significant difference was found in attitudes before and after the CLA course only in the quantitative group. Based upon the results of this study, it is recommended to offer different computer literacy courses to the different groups to improve students’ attitudes toward the use of these applications.

**Teo Timothy (2010)** studied the effect of gender on the pre-service teachers’ computer attitudes. Design/methodology/approach: A total of 157 pre-service teachers completed a survey questionnaire measuring their responses to four constructs which explain computer attitude. These were administered during the
teaching term where the participants were attending a technology course. Structural equation modeling, in particular, confirmatory factor analysis and multiple indicators. Multiple causes (MIMIC) modeling were used for data analysis. Findings: No statistical significance was found for gender in the four constructs of computer attitude. However, the mean scores for males are higher for three of the constructs. Overall data in this study provides evidence to support the notion that computer attitude is a multidimensional construct and has original value. This study contributes to the continuing interests among the researchers to study the effect of gender towards the computer. The results of this study did not support others which found significant differences in computer attitudes by gender. This may be due to heavy reliance of computers in many educational institutions for teaching and learning which consequently granted equal access to the male and female users.

*Tamer KUTLUCA* (2011) conducted a study on Computer Usage and Attitudes toward Computers of Prospective Preschool Teacher. The purpose of this study is to determine the status of computer usage and the attitudes toward computers of prospective preschool teacher and to investigate of several variables on their attitudes. For this purpose, “Computer Usage Information Form” and “Computer Attitude Scale” was applied to 126 prospective preschool teachers. This study is conducted with survey methods. The data is analyzed through standard deviation, mean value as well as t-test and one way ANOVA for group comparison, besides to find which group causes the difference in the group comparison, a PostHoc Tukey HSD test is employed. At the end of the study it is determined that the prospective preschool teacher use computers more at home and internet cafes and their levels of using computer programme are intermediate or upper. It is also determined that there is a significant difference according to the variables of taking computer course, computer ownership, level of using computer program, frequency of computer usage, computer experience and class of the scores of attitudes toward computers. On the other hand, there is no significant
difference according to the variables of gender. It is recommended that future studies should focus on investigating academicians’s level of usage of computer program and attitudes toward computer technologies.

*Ainnecia Yoag, Chin Su Na, Leau Yu Beng and Minah Japang (2012)* conducted a Study on Students’ and Teachers’ perception towards an Interactive Courseware for History Subject: A Case Study in Labuan Secondary Schools. The Malaysian education system is being transformed to create a new generation of students who are ready to adapt with new technologies and able to manage the information explosion. The need to incorporate ICT in teaching and learning at all levels of education is deemed essential. Multimedia Technology is playing an important role in the classroom as an interactive courseware in presenting and delivering the course material to the students. Most of the interactive coursewares available in the market now are focusing on Languages subjects, Mathematics and Science. This paper investigates the perception of form 5 history teachers and students in using interactive multimedia courseware as their teaching and learning channel in history subject. This research identified the features which influence student’s interest in learning history, as well as the possible challenges and constraints that might be encountered by their teachers in using interactive courseware. Furthermore, this study also highlighted some considerations before designing and developing the interactive multimedia courseware for history subject.

*Akin Efendioglu (2012)* studied the effects of Courseware Development model (CDM) on the primary school pre-service teachers’ achievement in the field of geography and attitudes toward computer-based education (ATCBE). The CDM consisted of three components: content(C), learning theory, namely, meaningful learning(ML) and multimedia(M). The CDM is designed to show the synthesis of the C and M components under ML. In this study, an experimental design including the pre-test and post-test groups is used to define the efficiency
of the CDM. There are 31 pre-service teachers in the control group, 28 pre-service teachers in the meaningful learning theory group-ML and 30 pre-service teachers in GTC group that uses geography teaching courseware-GTC based on the CDM.

The results of the analysis indicate that the courseware is quite effective, improving the pre-service teachers’ academic achievement as well as their ATCBE scores. The results also suggest that the new model has an appropriate structure for courseware design.

*Celik, Vehbi; Yesilyurt, Etem (2013)* studied the effect levels among the latent variables of attitude to technology, perceived computer self-efficacy, computer anxiety and the attitude toward doing computer supported education and these latent variables’ ratios to each other. For this, eight hypotheses were developed in light of the theoretical information by reviewing the literature. This research is done by using Technology Attitude Scale, perceived Computer Self-Efficacy Scale, Computer Anxiety Scale and the Attitude Scale toward Applying Computer Supported Education. The participant group of the research consists of 471 pre-service teachers. Exploratory factor analyses of the scales were analyzed via SPSS 16.0 software. For the confirmatory factor analyses of scales and the structural equation modelling, AMOS 17.0 software was used. The most significant finding of this study is that attitude to technology, perceived computer self-efficacy and computer anxiety are important predictors of teacher candidates’

*Orhan Ercan (2014)* conducted a Study on The effects of multimedia learning material on students’ academic achievement and attitudes towards science courses.

This study implemented multimedia learning material developed for the 5th grade science course topic “Food and Healthy Nutrition” and examined its effect on students’ academic achievement and science attitudes. The study used a control group, a pre-test-post-test quasi experimental research design, and a convenience
sample consisting of 62 5th grade students. The research instruments were an achievement test and a science attitude scale. During the implementation process the experiment group learned using multimedia learning material and the control group learned with traditional methods. Data were analyzed using an independent-samples t test, a paired-samples t-test, and AN-COVA statistics. According to the findings there is a statically significant difference between post-test achievement scores of the experimental and control groups, with the experimental group scoring higher. Also there is a statically significant difference between students’ post-test scores in terms of gender, favoring females the over males. In terms of science attitude there is also a significant difference between the post-test scores of the experimental and control groups. It is concluded that multimedia learning promotes more effective learning in science education.

*Orachorn Kitchakarn (2015)* conducted a study on EFL Learners’ Attitudes towards Using Computers as a Learning Tool in Language Learning. The study was conducted to investigate attitudes toward using computers as a learning tool among the undergraduate students in a private university. In this regards, some variables which might be potential antecedents of attitudes toward computer including gender, experience of using computers and perceived abilities in using programs were examined. The data was collected from 192 undergraduate students enrolled in two fundamental English courses (EN012 & EN 013). The instrument in this study was a questionnaire. The findings revealed that the students had positive attitudes towards using computers as a learning tool. The factors of gender and experience of using computers were not found to affect students’ attitudes while the factor of perceived abilities in using programs had an effect on their attitudes.

*Ahmet Sami Konca, et. al., (2016)* conducted a study on “Attitudes of Preschool Teachers towards Using Information and Communication Technologies (ICT)”.
The aim of the study is to determine the attitudes of preschool teachers towards using technological tools and to analyze it in terms of different variables. The research was conducted based on descriptive study model. A personal information form created by researchers and “The Scale of Attitudes towards Using Technological Tools in Preschool Education” developed by Kol were used to collect data. Frequency, percentage, mean and standard deviation were used in order to analyze the data. T-test for independent samples and one-way variance analysis were used in order to determine the relationships between variables. As a result of the study, the teachers showed a very positive attitude towards using technological tools. It was found out that preschool education graduate teachers showed a more positive attitudes towards using technological tools as comparing with the distance education graduate preschool teachers.

2.8 STUDIES RELATED TO ATTITUDE TOWARDS E-CONTENT

- INDIA

Narayanasamy (2000) studied at what extent the teachers in DIET’s and TTIs possess attitudes towards computers. The results showed that the respondents in the two types of the teacher training institutions showed very positive attitudes towards computers in education. Most of the respondents readily considered computer as a useful aid or tool for the teachers. The percentage of positive responses of these items was very high in many cases-well over 80%. About 75% of the respondents agreed or strongly agreed with the statement “Computers are more important in Educational Institutions than in other areas”.

Kumaran. D and Selvaraju. K (2001) studied the attitude of teachers towards computer. The data revealed that 1) In general, teachers had more inclination on computer based teaching. 2) Age of the teachers had little influence on computer attitude. 3) Younger teachers had more favourable cognitive computer attitude subscale. 4) Teachers with post-graduation qualification had
more favourable computer attitude. 5) The subject of specialization (faculty) of
the teachers had little influence on computer attitude. 6) The teachers belonging to
the Commerce and Science faculties had more favourable cognitive and effective
computer attitude. 7) Different types of managements of school had no significant
influence on teachers’ computer attitude. 8) The types of schools (Boys, Girls and
Co-education) had little influence on computer attitude. 9) The school belonging
to different boards of education had no significant influence on the teachers’
computer attitude.

_EpsyBai, et. al., (2002)_ investigated on “Teaching Attitude towards
Computers”. One of the main objectives was to find out what teachers think about
computer based teaching in schools to the students. The major findings were (a)
Gender and locale of the teacher do not influence their attitude towards computer
(b) Age has influence on the attitude towards computers (c) 51.14% of teachers
have a relatively have a favourable attitude towards computers.

_Rajasekar (2002)_ has made an attempt to study the B.Ed. Women Students’
Attitude towards Computers. The results of the study showed that the number of
women students with favourable attitude towards computer was more in the
graduate category than in the postgraduate category. Also it was shown in the
present study that the gender of the students influence their attitude towards
computer.

_Helen Joy and Manickam (2005)_ assessed the knowledge in computers
and attitude to Computer-Assisted Instruction of the science teachers. The results
of their study showed that the teachers’ attitude towards the use of computer
became more favourable with the increase in their knowledge in computer usage
and knowledge of Computer-Assisted Instruction. Even though the teachers have
a positive attitude towards Computer-Assisted Instruction, their attitude towards
the use of computers was not equally favourable.
Enok Joel. T. and Thangarajathi. S. (2011) made an attempt to find the influence of multimedia in enhancing attitude towards computer science at the higher secondary level. The objectives of the study were (i) to develop a multimedia package in teaching computer science at the higher secondary level, and (ii) To find out the effectiveness of multimedia on attitude towards computer science at the higher secondary level. The investigator selected XI Standard students of Bishop Heber Higher Secondary School, Trichy as the sample of study. The experimental design employed in this study was the randomized pre-test - post-test design. The tools used in the study were the multimedia package and the attitude scale toward computer science. The attitude scale consisted of 50 items with a five point scale. The findings of the study were (i) the attitudes means scores of control and experimental groups do not differ significantly at the pre-test. Further, these two groups have similar in terms of their attitude, and (ii) the attitudes mean scores of control and experimental groups differ significantly at the post test. It is concluded that the higher mean scores of experimental group student had a better attitude than the control group.

Amrit Pal Kaur (2011) conducted a Study on Pre-Service Science Teachers’ Attitudes towards the use of selected ICT tools in Teaching: An Exploratory Study. The result of the study into the field of Information and Communication Technology (ICT) integration in education has indicated that teachers’ attitudes towards ICT play a crucial role in the use of ICT by them. However, there is serious lack of qualitative studies to investigate the ICT related attitudes of the pre-service teachers, particularly science teachers. This qualitative study was conducted to explore the ICT use related attitudes of pre-service science teachers at the University of Adelaide. The specific aims were to identify the factors leading to these attitudes and to investigate the changes in their attitudes after teaching practice. The research was carried out in two phases i.e., pre- and post-teaching practice. Open-ended questionnaires were used to collect data from
self-selected participants, followed by in-depth one-to-one semi-structured interviews of purposefully selected participants in the second phase. The findings from the data analysis, using comparative and open-coding techniques, indicated that the overall attitudes of student-teachers were positive. But issues like lack of ICT facilities at schools and lack of ICT related knowledge and skills among the student-teachers were emerged. It is recommended that the student-teachers should get appropriate training and opportunity to use ICT in educational contexts. Further large-scale research is needed to give suggestions for new policies.

Gunmala Suri and Sneha Sharma (2013) conducted a Study on Impact of Age on student’s attitude towards e-learning: A study on Panjab University, India

This research builds a multiple approach to examine individual attitudes toward the computer technology and e-learning. Based on the age of students and the access and usage of internet by the students, this research examines the attitudes of the university students toward e-learning and computer technology. The study employed a survey approach to examine e-learning attitudes of the students. The target population was the students studying in the Panjab University campus. A total of 500 questionnaires were distributed among various faculties of the university. It included Faculty of Arts, Faculty of Science, Faculty of Business Management, Faculty of Engineering, and Faculty of Law. The departments covered in the five faculties were over 10.

The major findings of this study give us resourceful information. First, it successfully uses a newly constructed scale for measuring computer and e-learning attitude. Second, this research also reveals that age is not a significant criterion that affects computer attitude and e-learning attitude. Third, the results revealed that no significant correlation exists between the age of students and their response towards provision for access to classroom lectures online and provision of e-
learning facilities by department. These results can further be used as inputs for proper implementation of the e-learning process at any education setting.

*Gopal B.V. and Anandan K., (2013)* conducted a Study on Attitude towards e-Learning in Classroom Instruction among the B.Ed., Students at Colleges of Education

The paradigm shift in the field of education triggered by the grey revolution is matched by real life teaching learning situations. The whole game of education becomes learner centric and learning centric. To be in the paradigm shift that the world of education witnessed any teacher of any level of education must adapt their relationship with the learners, switching from soloist with learners, switching from soloist to accompanist and shifting the emphasis from dispensing information to helping the learners seek organized and manage knowledge guiding them rather than moulding them. One of the main tasks of education in a modern society is to keep pace with the advancement of Technology in acquiring the related information from the reliable e-Resources. One has to change the mind set of people by educating them about the power of e-learning.

Online learning could help bridge the gap between distance education and formal education. The Attitude on e-Learning in Classroom Instruction is an important factor among the B.Ed. Students in order to implement the usage of it in a productive way. Therefore the present study attempts to assess the level of “Attitude on e-Learning in Classroom Instruction among the B.Ed. Students at the Colleges of Education”. This study belongs to the Survey Research Method. The investigators had selected 360 B.Ed. Students as sample by Random sampling technique from 2 Self-Aided colleges and 2 Government Colleges in Bharathidasan University Catchment Area.

The investigators have developed the tool, ‘Attitude on e-Learning in Classroom Instruction (AECI)’ based on the four components such as Multimedia,
Web, Video-Conferencing and Closed Circuit Television (CCTV). The Tool consists of fifty items in a Four-point Rating Scale. The Correlation Co-efficient of the reliability of ATP was found to be 0.87, which is highly reliable. The tool was administered to the 360 B.Ed. students.

From the findings of this present study, it is seen that the Total Mean value towards the attitude on e-learning in the classroom instruction is 53.03 out of maximum value of 100 which is found to be average among the B.Ed. Students in the colleges of Education. There is a significant difference between the scores of the attitude of the B.Ed. students towards e-learning for classroom instruction with respect to their discipline of the Subject-wise. It is concluded from the study that the B.Ed. students are to be strengthened to utilize the e-learning components in their classroom. The teacher-educators may be given in-service training on e-learning, so as they can be able to use the e-learning features in their teaching methods. Therefore the Teacher-educators can keep their students more attentive and to make them to understand the concepts of their subject-matter easily which would enhance their learning process.


E-learning is considered to be a more effective way of learning and teaching in larger group of students, thereby providing consistency in the educational quality. The attitude towards e-Learning would influence the learning of any individual. Therefore the students of education are not different from that of users of e-gadgets who would enter the teaching profession and who would use the e-Learning technology during their teaching learning process. Hence the present problem is undertaken to study the attitude of the students of education (M.Ed) towards e-Learning and to understand the influence of various variables.
The study revealed that 77% of M.Ed students had favorable attitude towards e-Learning. The trend indicates positive attitude on their readiness to follow e-Learning classes. Therefore the instruction need to be done using the e-Learning materials and this paves way for better results among the students in their academic subjects. The educational system creates comprehensive and collaborative learning climate with the usage of eLearning system and every class room needs LCD projectors with laptop and the students may be encouraged to learn the application of computers for solving various educational problems.

Arumugam Raman, et. al., (2015) conducted a study on Teachers’ Attitude toward Computer Use in Classroom Practice Innovation of computer technology as a learning tool dramatically changes the traditional concept of teaching.

Now-a-days, computer is considered as a means of achieving the educational goals where teachers’ role is like a facilitator. However, the teachers’ attitude is an important issue on integrating computer in modern classroom teaching -learning process. The aim of this study was to investigate the prospective teachers’ attitude toward computer use in the classroom practice. The current study was followed by the survey research design. Selected items from different Computer Attitude Scales (CAS) and Technology Acceptance Model (TAM) were used to collect data using 5 point Likert type scale. The population was the students enrolled in Information Technology under Educational Studies discipline [B. Ed.(Hons.)] in UUM, CAS and the sample were the final semester students of same discipline. This study was covered with the minimum number of sample size. The overall results illustrate that the prospective teachers are intended to use computer in the classroom practice. However, the attitude toward computer use differed with male and female. The result also suggests that the prior computer experience is another factor toward computer use in education. It also can be concluded that the perceived usefulness, perceived ease of use and affective component are considered as important factors in the acceptance of computer in
the classroom practice. This result may be useful to the professional development of prospective teachers and teacher educators. It may be a source of supportive paper to the policy makers, curriculum developer, and administrator. Therefore, the findings of the study has significant effect in computer integration into curriculum instruction as well as it is useful in attaining the goal of national policy on education which aimed at the Malaysian vision 2020.

2.9 SUMMARY OF REVIEW OF RELATED LITERATURE

Comparatively very few experimental researches with development of e-content are done. Specifically such experiment works are done for the school and college students and they are mostly in every branch of physical science, statistics, engineering, economics, medicine, demography and languages etc. The research done in India in mathematics with e-content for the students of school and college level is very less in number.


As far as the investigator knows, the reviews provide to make out the conceptual frame work, sources for hypotheses, method, procedure, sources of data and statistical techniques for the present study. As no study was found related to teaching of mathematics education at B.Ed level with the help of e-content presentation, the researcher having consulted with experts, mathematics teachers and other resources, intended to develop an e-content in Teaching of Mathematics Education for B.Ed. students-teachers.
2.10 RATIONALE OF THE PRESENT STUDY

The following are the rationale for the present investigation:

Based on the review of related literature, it is concluded that only a few research works have been conducted in India regarding the development of E-content. The findings of these studies established the supremacy of the E-content. All the related studies suggest that the technology oriented teaching methods are more effective than the conventional methods of teaching. Moreover, the review recommends a change over from the conventional method to technology oriented teaching methods. The related studies discussed in this chapter have made the investigator to realize the importance of technology oriented teaching and learning over the conventional methods. Hence, the investigator is interested in developing the E-content in teaching of mathematics education for B.Ed student-teachers.

2.11 CONCLUSION

The objective of the review of the related literature helps in knowing the evidence already available and solves the problem adequately to proceed from known to unknown. Thus the survey of related literature helps the investigator in identifying the research gaps in the area of the study. The next chapter deals with the methodology of the study.