CHAPTER-II

REVIEW OF RELATED LITERATURE

2.1. INTRODUCTION

Review of related literature and researches is the foremost prerequisite of any research work. Research cannot be a link in a chain. Every study should be based on relevant thinking and research that has preceded it. Study of previous research tells the researcher what is already known and what is still unknown and untested. So any new research is built upon and adds to what is known up to that point of time.

“A literature review is a systematic explicit and reproductive tool for identifying evaluating and interpreting the existing body of recorded work produced by researchers, scholars and practitioners.” (Fink, 1998)

According to Ary et al. (1972) organizing related literature is like proposing an expedition, by mapping out the known territory and pointing the way to the unknown one proposes to explore. If the study has several aspects or is investigating more than a single hypothesis this is done separately for each facet of the study. One should avoid the temptation to present the literature as a series of abstracts. Rather, it should be presented in such a way as to lay a systematic foundation for the study.

A Review of Related Literature is not just a listing of the research studies from the selected specialized area, but an attempt to survey the state of knowledge and identify any gap. The present researcher has reviewed the literature on pedagogy to find out what others have found in their studies. For the purpose, he visited various institutions and surfed the internet.
2.2. STUDIES ON SELECTED INSTRUCTIONAL APPROACHES LIKE MULTIMEDIA, MASTERY LEARNING, LABORATORY METHOD WITH REFERENCE TO ACHIEVEMENT IN OTHER SUBJECTS – ABROAD

Olew Numan and Sobski (1998) investigated the influence of explicit problem solving instruction on students’ problem solving ability and conceptual understanding as compared to instruction in textbook style problem solving. The Force Concept Inventory (FCI) was used by them to measure students’ conceptual understanding at the beginning and at the end of the semester. And they indicated a significant difference between the explicit problem solving group and the textbook style problem solving group in students’ conceptual understanding and problem solving performance in favor of the former.

Mathew (1999) found that the concept attainment model and the advance organizer model were equally effective in the teaching of population education.

Ojha (2000) developed an instructional material for teaching Economics through the concept attainment model and showed that the instructional material was effective in terms of students achievement, retention, self-concept and attitude towards Economics.

The effectiveness of the concept attainment model on achievement in Arabic grammar of standard IX students was studied by Shamnad (2005) it was found that the concept attainment model was better than the conventional method in teaching Arabic grammar.
Eryilmaz, Geban and Yilmaz (2006) investigated the effects of bridging analogies teaching strategy and gender on Turkish high school student’s misconceptions in mechanics. The results showed that bridging analogies teaching strategy was an effective means of reducing the number of misconceptions students had about normal forces, frictional forces, tension, gravity, inertia and Newton’s third law.

Loveland, (2007); Morgan, Sneed & Swinney, (2003) found that the student evaluation of teaching (SET) improved the teaching performance of lecturers. According to many researchers student evaluation is a valid, reliable, and worthwhile means of evaluating teaching (Wachtel, 1998).

Erdogan et al (2008) describes the concept of satisfaction as an object, situation that meets a person’s needs, or his attitude towards a situation. There have been several studies on satisfaction. They mostly analyze the effect of satisfaction, which is a very significant variable for assessing the efficiency of teaching methods like online courses, web-based courses and distance learning. The studies made by Khaki et al., 2007, Kingsland, 1996; Klein & Pridemore, 1992 show that teaching methods like PBL or cooperative learning have a positive effect on satisfaction.

Pany (2008) conducted a study on the effectiveness of Making Familiar Strange (MFS) approach of the synectic model of teaching on development of learner’s creative thinking ability, development of academic achievement and achievement motivation. The major finding of the study showed that the MFS approach of Synectics model of teaching was very effective in enhancing the creative thinking ability of the learners. But the MFS approach did not prove to be
effective in promoting achievement of the learners in science and also it did not put any significant impact upon the achievement motivation of learners too.

_Susan E. Cooperstein and Elizabeth Kocevarweidinger (2008)_ investigated on the topic “A constructivist approach to learning”. Guided by four principles learners construct their own meaning; new learning based on prior knowledge; learning is enhanced by social interaction; and learning develops through “authentic” tasks Constructivist learning- moves flow experience to knowledge and not the other way around. In a constructivist class room, the activities lead to the concepts; the students construct the meaning. Learning happens. Abstract concepts become meaningful transferable, and retained because they are attached to performance of a concrete activity.

_Block et al, (2009)_ in this study, revealed that individual schema – based learning operates under the understanding that a student’s schema is “his or her organized knowledge of the world” and that this provides a basis to process read information, have a point of reference with which to infer meaning, summarize information, and be able to remember information read at later dates (p 263). Researchers have found that all these skills are key to developing fluent reading comprehension. A teacher helps create this schema by providing hints and ideas which a student can relate to and work from while reading silently.

_Block, Whitely, Parx’s Reed and Cleveland (2009)_ studied the effects of adding an additional 20 minutes a school day to six different approaches to improving reading comprehension. The six different approaches were: workbook practice, individualized schema–based learning, situated practice, conceptual learning, transactional learning, and traditional instruction.
Bachrata K and H. Bachraty (2011) investigated the topic “E-learning in Mathematics”. The problems in E-learning course in the market show that besides the development of new technologies, it is necessary to also pay attention to other factors that affect the creation of meaningful courses. These factors are the content of the said courses, and their real applications as related to their didactic and educational aims. Furthermore, attention has to be paid to the administration and maintenance of courses and the training of educators in their proper use.

Hui-Chuan Chu, Min-Ju Liao, Tsung-Yi Chen, Chia-Jou Lin, and Yuh-Min Chen (2011) studied the case adaptation for problem-oriented E-learning on mathematics teaching with students with mild disabilities. Both problem-oriented learning and case-based learning are effective methods for practical knowledge development. However, the efficacy of automatic development of learning through 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 students with mild disabilities, the 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 students with mild disabilities so as to assist regular and special education teachers to develop practical knowledge of teaching more effectively.
Kim, Mi-RyangKim, Tae Ung Kim, and Jaehyoun (2011) in their research have employed a quantitative modeling framework to develop a structural model that embodies the flow concept and interactivity components of what makes for satisfactory learning experiences. Over the past decade, E-learning has had an enormous impact on all levels of education. E-learning is expected to provide a variety of communication channels among students and faculty, and offer students flexibility beyond the space and time limit. However, some claim that where on-line delivery may be beneficial for some students, others feel dissatisfied with on-line courses as the result of feelings of isolation and lack of interaction. This case focuses on the e-learner satisfaction, as global teaching effectiveness as perceived by adult part-time students, and introduces various dimensions of E-learning to evaluate their direct and indirect impact on global teaching effectiveness. The data were collected from student survey to measure these constructs and fit a structural equation model.

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 was meant to demonstrate the feasibility of integrating three rather different theoretical perspectives on future efforts in multimedia instructional design. A multimedia instructional grammar program contextualized within the teaching of English as a Second Language (ESL) 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 the history and geography of the USA. 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.

Martinez-Torres, M.R., Toral, S.L., and Barrero, F. (2011) analyzed a scientific technique called concept mapping that proposes to identify the external variables that should be kept in mind while designing E-learning tools. As a result, improvements can be programmed to increase the utility of materials in the teaching activities prior to its use. The method has been tested in the development of an E-learning system used for advanced microprocessor teaching. Results are shown through two-dimensional maps, in which variables can be seen as clusters or groups of ideas. These variables can be used as a guide for fine-tuning the eLearning tool. The reliability of the results is also analyzed to check the correct application of the proposed technique.

Michele Biasutti (2011) made a study of the student experience of a collaborative E-learning university module. The aim was to present a picture of student experience in 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 teachers was assessed using a self-evaluation questionnaire that gathered quantitative and qualitative data about student satisfaction about 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 participant’s perspectives. General open questions on satisfaction and dissatisfaction were analyzed with an inductive analysis which showed the evaluation criteria used by 92 students. Results of the analysis showed five themes in 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 on improvements of E-learning include: more collaboration between students since some students engage differently; more coordination and organization, better workload management in group activities, some technical problems such as updating modifications.

Norngainy Mohd Tawil et al. (2011) researched the topic, “E-learning versus Traditional Method in Teaching Mathematics and Statistics Courses for Engineering Students in Universiti Kebangsaan Malaysia. In this study, they examined students’ perceptions, 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, as 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 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 the effectiveness of Mathematics and Statistics courses. Overall, lecturing was significantly perceived as of more and favorable to the learning process in both courses compared to the newly-introduced WILEY PLUS.

Sarah J. Stein, Kerry Shepherd and Irene Harris (2011) in their article titled “Conceptions of E-learning and Professional Development for E-learning Held by Tertiary Educators in New Zealand” revealed that conceptions of E-learning provide some insights for individuals, institutions, and those responsible for planning and implementing professional development programmes to help them support the development and progress of E-learning in appropriate and rewarding directions.

Sung, Yao-Ting., Chang, Kuo-En., and Yu, Wen-Cheng (2011) have attempted to introduce in their paper, the methods of E-learning courseware quality assurance (a quality certification system) adopted by the eLQSC (E-learning Quality Service Centre) in Taiwan. A sequential/explanatory design with a mixed methodology was used to gather research data and conduct data analyses. Sixty-seven E-learning courseware applications were evaluated using the E-learning Courseware Quality Checklist (eLCQC). Analyses of item difficulty, item discrimination, and generalizability indicated that the eLCQC provides high-quality evaluations. After participating in the certification process, the E-learning producers reported having more confidence in enhancing E-learning courseware quality. The certification experience also helped the producers to change their previous designs.
and concepts about E-learning courseware and to develop new concepts. Further, their increased confidence about courseware design also enhanced their confidence in marketing courseware.

Tseng, Ming-Lang, Lin, Ru-Jen, and Chen, Hui-Ping. (2011) have attempted to evaluate the effectiveness of teaching or learning in an E-learning system measures on linguistic preferences. There is a trend among universities in Taiwan to offer more and more E-learning courses. The effectiveness of teaching or learning in an E-learning system can be quantified by multi-criteria measures. A generalized quantitative evaluation model that considers both the interdependence among measures and the fuzziness of subjective perception is currently lacking in the literature. The results indicated that the fuzzy analytical network process is a simple, suitable, and effective method of identifying the primary measures that influence the effectiveness of E-learning, specifically in the context of interdependent measures and varying linguistic preferences. The findings that were the most significant measures of E-learning effectiveness were the quality of the E-learning system and learner interest. Enhanced usage of multimedia features can attract learner attention and may eventually increase learner acceptance. Reducing the waiting time for learning materials to be loaded may improve the quality of the system.

Al-Abbasi, Daniah (2012) has written an article “The Effects of Modality and Multimedia Comprehension on the Performance of Students with Varied Multimedia Comprehension Abilities when Exposed to High Complexity, Self-Paced Multimedia Instructional Materials” in which he has examined the effects of modality and multimedia comprehension on the performance of students with varied
multimedia comprehension abilities when exposed to high complexity, self-paced multimedia instructional materials. A 2 x 2 generalized randomized block design with two levels of multimedia comprehension and two levels of modality was employed. The dependent variables were retention and transfer. A sample of 115 students participated in the study. The ANOVA results for the modality factor showed that modality had little or no effect on students' performance in the retention test. However, it had some effect on students' performance in the transfer test. The ANOVA for multimedia comprehension showed that multimedia comprehension significantly affected students' retention and transfer performance; average and above average student significantly outperformed below average students. Finally, the ANOVA for the interaction effect demonstrated a significant interaction effect in the transfer measure and not the retention measure. A reverse modality effect was found in the average and above average groups. The transfer performance of the average and above average group in the unimodal condition was higher than in the bimodal condition.

Chen, Chih-Ming and Sun, Ying-Chun (2012) have written an article on the topic “Assessing the Effects of Different Multimedia Materials on Emotions and Learning Performance for Visual and Verbal Style Learners”, Multimedia materials are now increasingly used in curricula. However, individual preferences for multimedia materials based on visual and verbal cognitive styles may affect learners' emotions and performance. Therefore, in-depth studies that investigate how different multimedia materials affect learning performance and the emotions of learners with visual and verbal cognitive styles are needed. Additionally, many education scholars have argued that emotions directly affect learning performance. Therefore, a further
study that confirms the relationships between learners' emotions and performance for learners with visual and verbal cognitive styles will provide useful knowledge in terms of designing an emotion-based adaptive multimedia learning system for supporting personalized learning. To investigate these issues, the study applies the Style of Processing (SOP) scale to identify verbalizers and visualizers. Moreover, the emotion assessment instrument emWave, which was developed by HeartMath, is applied to assess variations in emotional states for verbalizers and visualizers during learning processes. Three different multimedia materials, static text and image-based multimedia material, video-based multimedia material, and animated interactive multimedia material, were presented to verbalizers and visualizers to investigate how different multimedia materials affect individual learning performance and emotion, and to identify relationships between learning performance and emotion. Experimental results show that video-based multimedia material generates the best learning performance and most positive emotions verbalizers. Moreover, dynamic multimedia materials containing video and animation are more appropriate for visualizers than static multimedia materials containing text and image. Finally, a partial correlation exists between negative emotion and learning performance; that is, negative emotion and pretest scores considered together and negative emotion alone can predict learning performance of visualizers who use video-based multimedia material for learning.

Liu, Yuliang. (2013) in his article, “A Comparative Study of Integrating Multimedia into the Third Grade Math Curriculum to Improve Math Learning”, has
done a quasi-experimental study, to design, develop, and implement a multimedia maths lesson in third grade to improve students' maths 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 midwest USA. The independent variable was the multimedia math lesson and the dependent variable was students' maths performance. It was hypothesized that the (a) teacher and students scored favorably about the multimedia math lesson, (b) students were very attentive to multimedia math instruction, and (c) the students scored statistically higher on the posttest at the end of the intervention in the experimental group than in the control group. The findings have theoretical and practical international implications for K-12 education.

*Maree, Ton J.; van Bruggen, Jan M.; Jochems, Wim M. G. (2013)* in their article “Effective Self-Regulated Science Learning through Multimedia-Enriched Skeleton Concept Maps” combined work on concept mapping with scripted collaborative learning. The objective was to examine the effects of self-regulated science learning through scripting students' argumentative interactions during collaborative "multimedia-enriched skeleton concept mapping" on meaningful science learning and retention. Each concept in the enriched skeleton concept map (ESCoM) contained annotated multimedia-rich content (pictures, text, animations or video clips) that elaborated the concept, and an embedded collaboration script to guide students' interactions. Sample: The study was performed in a Biomolecules course on the Bachelor of Applied Science program in the Netherlands. All first-year students (N = 93, 31 women, 62 men, aged 17-33 years) took part in this study. The
design used a control group who received the regular course and an experimental
group working together in dyads on an ESCoM under the guidance of collaboration
scripts. In order to investigate meaningful understanding and retention, a retention
test was administered a month after the final exam. Results: Analysis of covariance
demonstrated a significant experimental effect on the Biomolecules exam scores
between the experimental group and the control, and the difference between the
groups on the retention test also reached statistical significance. Conclusions:
Scripted collaborative multimedia ESCoM mapping resulted in meaningful
understanding and retention of the conceptual structure of the domain, the concepts,
and their relations. Not only was scripted collaborative multimedia ESCoM mapping
more effective than the traditional teaching approach, it was also more efficient in
requiring far less teacher guidance.

_Palilonis, Jennifer; Butler, Darrell; Leidig-Farmen, Pamela (2013)_ a team
of multimedia developers at a Midwest university created a media interface for
educational multimedia in their study “Design Interactive: A Nonlinear, Multimedia
Approach to Teaching Introduction to Visual Communication and Principles of
Design”. Then, a text titled "Design Interactive" was developed within this
framework and administered in several sections of a 100-level visual communication
course for journalism students. Students' attitudes about the text were solicited, and
test scores were compared to previous iterations of the course in which "Design
Interactive" was not used.

_Rusanganwa, Joseph (2013)_ in their study “Multimedia as a Means to
Enhance Teaching Technical Vocabulary to Physics Undergraduates in Rwanda”
investigated whether the integration of ICT in education can facilitate teaching and learning. An example of such integration is computer assisted language learning (CALL) of English technical vocabulary by undergraduate Physics students in Rwanda. The study draws on theories of cognitive load and multimedia learning to explore learning in a one-computer classroom in an environment where textbooks and multiple computers are not available. Two groups of students attended a 4-week English-language technical vocabulary course (eight three-hour sessions) taught by two ESP trained science teachers. One group (n = 13) was taught using computer-mediated multimedia to present technical vocabulary on-screen. The other group (n = 19) received blackboard presentations employing traditional methods to help students internalize the same vocabulary. Post-test scores of the two groups were compared. The results show that the effect of multimedia on the recall of the concepts taught is large (Cohen's "d" 0.95).

Intakhab Alam Khan (2014) in his article titled “Need of e-training for the academic staff of the Universities in India” stressed the importance of said training in the 21st century society which is truly known as digital and cyber society. People are found using the electronic media for communication in larger scale. Sometimes, it appears as if we are quite handicapped in the absence of technology. Educational technology has been in active use for a long time especially in most modern educational institutions of all the levels in India and abroad. The presence of sophisticated tools and innovative pedagogy naturally force the educators, researchers, pedagogues and university teachers to equip them in the area of technology in general and e-learning in particular in the current learning-teaching
environment. University teachers are expected to utilize the multi-media, mobile learning etc. in order to make the teaching process more interesting.

2.3. STUDIES ON SELECTED INSTRUCTIONAL APPROACHES LIKE MULTIMEDIA, MASTERY LEARNING, LABORATORY METHOD WITH REFERENCE TO ACHIEVEMENT IN OTHER SUBJECTS - INDIA

*Nelson and Pan (1995)* conducted a study on integrating the concept attainment model and videodisk images. They investigated pre-service elementary teacher’s responses to a concept attainment task using videodisk pictures and line drawings. The findings indicated that students using videodisk pictures used inferences to construct patterns while students using line drawings in connection with pictures significantly made more observations and developed fewer ideas to make video patterns.

*Anandi and Irene (1996)* undertook a study to prepare instructional materials based on Synectic model of teaching for developing creativity (cited in Talwar & Sheela, 2004). The instructional materials developed were found to be effective in increasing fluency and flexibility, but were not effective in increasing originality.

*Agarwal (1997)* reported that advanced organizer model and concept attainment models were found more effective than the conventional method in fostering concept learning.

*Ismail (1997)* studied the effectiveness of the synaptic model of teaching English for developing creativity among secondary school students and reported that the model was effective for developing creative thinking among students.
Vaidya (1997) made an attempt to study the effect of mastery learning and concept attainment on achievement in Hindi, self-concept and attitude towards Hindi of upper primary school children. The results indicated that mastery learning was more effective than all concept attainment model in enhancing achievement as well as self-concept and attitude.

Lekha (2000) and Prabhakaran and Rao (1998) found that the concept attainment model was more effective than traditional method in teaching concepts in mathematics at secondary school level.

Rathod and Varma (2000) developed an integrated strategy using the concept attainment model and inquiry training model and compared the integrated strategy with the conventional method. It was found that the integrated strategy improved inductive reasoning abilities of students significantly as compared to conventional method.

Natesan (2001) studied the effects of teaching concepts in mathematics through video cassettes compared with traditional methods. The study implied that the increased level of academic achievement of experimental group was due to the teaching of mathematical concepts through video cassette. It was also found that girls performance was better than that of boys.

Sharma (2001) developed self-learning cards for developing concepts on the basis of Bruner’s concept attainment model and studied the effectiveness of the cards. It was found that it was quite effective.
Krishnakumari (2002) compared the effectiveness of the Concept Attainment Model (CAM) and Inquiry Training Model (ITM) with traditional methods and concluded that CAM and ITM were equally effective and they were more effective than traditional methods.

Sivakumar (2003) developed a strategy based on the memory testing model of Harry Lorayne and Jessy Lucas (1974) to enhance memory at the primary level. This newly developed strategy involves six steps in accordance with the various principles of memory with special reference to the principles advocated by Harry Lorayne and Jessy Lucas (Sivakumar & Krishnaraj, 2003, p. 162).

Bairagya, Ghosh and Meta (2005) found that Concept Attainment Model (CAM) was comparatively more effective teaching treatment than the traditional method of teaching economics at the higher secondary school level. It was also found that the CAM was more effective in expanding to the cognitive domain of students.

Savitha kumari (2005) investigated on the instructional effect of a synectics model in enhancing creative thinking and achievement in Hindi poetry at secondary level and found it to be effective.

Minikutty (2005) explored the effect of the concept attainment model on achievement in mathematics of academically disadvantaged secondary school students. The study revealed that it was more effective than conventional methods in teaching mathematics to academically disadvantaged students.
Rama, Rani and Kaur (2010) developed a Mathematics Concept Understanding Test to assess the mathematical concept understanding of students. It is observed from the study that the concept attainment model was more effective in terms of concept understanding than traditional methods of teaching.

The effectiveness of the concept attainment model and advance organizer in teaching of English in teacher education courses compared by Ahmed, Gujjar and Ali (2011). They proved that the concept attainment model was an effective instructional strategy in teaching English. It was also found that trainee teachers taught through concept attainment model registered better performance in post-test scores.

Leo Stanly, S. (2012) compared the effectiveness of e-learning modules with that conventional teaching method with the Science and Maths group students. The sample of the study consisted of thirty learners from the XI standard of Shri Hindocha Govt. aided Higher Secondary School, Ariyur, Pondicherry. By means of pre-test and post-test, it was observed that the experimental group’s performance was far superior to that of the control group. The study clearly revealed that the e-learning modules prepared by the teacher could have immense impact on learning Mathematics.

Mushtaq Ahmed I Patel and Mohasina Anjum A Ansari (2014) attempted a study on “Computer assisted Instruction and Audio Program Which one is more effective”. The purposive random sampling method was adopted for the study. The standard Progressive matrices test, and Audio programs were used as tools. It was found that the students taught by CAI achieved much better than the students taught through audio program.
Sahayarani J. (2014) has done a research titled “Effectiveness of Multimedia Approach in History at the High School Level”. The purposive random sampling method was adopted for the study. Investigator developed a Multimedia approach in teaching and learning History. The design used in the study was Pre-test-post-test control group design. The sample of the study consisted of 40 IX standard students of Vidhya Bhavan Higher Secondary School, Uppalam, Pondicherry, and they were divided into control and experimental groups having 20 students in each. The results revealed that the Multimedia lessons in History were found to be effective. The performance of the learners in the experimental group in the post-test was better than that in the pre-test.

Suman Dalal (2014) has written an article on the topic “E-training- the future world of education”. In his conceptual paper he has dwelled upon e-training, need for e-training, objectives of e-training and has explained in detail the conditions of e-training. Also he has given the guidelines of e-training and how to evaluate the e-training. He has concluded by saying that there is no doubt, ICT and its components will replace the future teacher education and in-service programs with e-training. It will replace the seminar paper presentations, conferences, workshops and even in-service training.

The study made by Pereira (2000) found the effect of audio-laboratory instruction in deforming the teaching of science in primary schools of Kerala. The major objective of the study was the preparation of audio instructional lessons in science and testing their effectiveness. Hence the experimental method was found to be the most appropriate one. The study revealed that the audio laboratory
instruction could be effectively used for improving the achievement of students in science at the primary level.

2.4. STUDIES ON SELECTED INSTRUCTIONAL APPROACHES LIKE MULTIMEDIA, MASTERY LEARNING, LABORATORY METHOD WITH REFERENCE TO ACHIEVEMENT IN SCIENCE - ABROAD

Seymour and Hewitt (1997) reported that our science teaching was the most common complaint made by all under graduate students. They also found that the most effective way to retain students from under represented ethnic groups was to improve the quality of the learning experience. The approach that teachers use to help students learn is an important factor that affects students’ interest levels. Traditional methods of instruction which often include lecturer, note taking and 'cook-book' science may not be as effective as hands-on, inquiry based methods.

Glynn and Takahashi (1998) examined the role of elaborative analogies when middle school students learn major concepts from science texts. The study revealed that the analogy mapped a familiar, concrete schema onto that of the target concept, making the target concept more understandable and memorable.

Lombardo (2000) explored certain factors and skills that have an effect on laboratory-centred, inquiry-focussed science instruction. Results indicate that science teachers agree that access to laboratory facilities, safety equipment and laboratory instruments are most important in laboratory centered and inquiry focused instruction.
**Krystyniak (2001)** explored the effect of participation in an extended inquiry project on general chemistry students on laboratory interactions, confidence and process skills. Research results indicate that participation through open inquiry laboratory increases student confidence and for some students the development of the ability to use science process skills.

**Milne (2002)** investigated the reflective practice and the instructional uses of analogies by secondary school chemistry teachers and reported that the majority of teachers adopted a more thoughtful, analytical perspective and the instructional uses of analogies.

**Alparslan, Tekkaya and Geban (2003)** investigated the effect of conceptual change in improving learning. The results indicated that the conceptual change instruction that explicitly addressed students' misconceptions produced significantly greater achievement in the understanding of respiration concepts.

**Hewson and Hewson (2003)** examined the effect of instruction using students prior knowledge and conceptual change strategies on science learning. The students’ prior knowledge provides an indication of the alternative conceptions as well as the scientific conceptions possessed by the students. The results showed a significantly greater improvement in the acquisition of scientific conceptions as a result of the instructional strategy and materials which explicitly dealt with students alternative conceptions.

**Paris and Glynn (2004)** conducted a study on elaborate analogies in science text and found that elaborate analogies enhanced learning in Science, increased learner’s retention of new ideas and also helped learners to assess more accurately
their comprehension of target concepts. It was also found that carefully crafted analogies helped the learners to make correct conceptual inferences giving rise to misconceptions.

*Hough and Piper (2008)* investigated the relationship between attitude towards science and science achievement. They collected data from 583 intermediate elementary students. These students were pre- and post-tested. After the analysis of data it was found that there was a significant positive relationship between students’ attitude towards science and science achievement ($r^* = 0.45$). The students with positive attitudes towards science had higher level of achievements. On the other hand, the students with negative attitudes had lower level of achievement in science.

*Nicholas and Ng (2008)* explored the blending of the arts into students learning of science concepts through role-play and drama. The study points out that by providing the initial "thinking activation" and promoting self-efficacy in the students, such activities were able to draw on and further develop their communicative, creative and higher order thinking skills by bringing abstract science concepts to a more concrete and visual form.

*Oliver and Simpson (2008)* conducted a longitudinal study in central North California to explore the influence of attitudes on achievement in science. Initially data was collected from a group of 5000 students from grades 6-10 in 1980-1981. The results of the study indicated that there was a positive relationship between attitudes towards science and achievement in science at different grades.
Willson (2008) conducted a study on meta-analyzed 43 different studies to find out the correlations between attitude towards science and achievement in science. The populations of these studies were the students of kindergarten through undergraduate college level. Multiple regression analysis and ANOVA were used for the analysis of data to find out the correlations between attitude towards science and science achievement. From the meta-analysis of these 43 studies, it was concluded that attitude towards science and achievement in science had a positive correlation. It was also indicated that had correlations was low at the elementary level but from grades 7 to 11, the correlation between attitudes towards science and science achievement was highly positive.

Ferreira (2009) examined gender issues with respect to attitude towards science and achievement in science. The results of the study declared that attitude of the students towards science were reflected in their achievement in science. There was a positive significant relationship between attitude towards science and achievement in science. Positive attitude of the students towards science caused the higher achievement in science.

Mattern (2009) conducted a study for the determination of gender differences in relationships to attitudes toward science with achievement. 1,238 students of 7th and 8th grades were selected as sample. This sample was selected from eight different schools in Northern New Mexico. Three instruments (one for attitude towards science and two for achievement in science) were used for the collection of data. It was indicated that among girls there was no significant
relationship between attitudes and achievements. Among boys, the results were different.

*Schan (2009)* investigated the relationship of attitude towards science with achievement in science. The data was collected from 20 Physical Science classes. The analysis of data expressed that there was a significantly positive correlation of students’ attitude towards science with their achievements. It was concluded that achievement in science was affected by attitude towards science.

*Jang (2010)* evaluated a collaborative concept mapping with co-teaching techniques in elementary science classes. It was found that co-teaching facilitated the implementation of collaborative concept mapping and the construction of student’s concept mapping.

*Richwine and Pebble Lea (2010)* carried out a study whose purpose was to investigate the impact on high school student's knowledge and attitudes regarding science and astronomy and beliefs about the nature of science after participating in an extended authentic, inquiry-oriented, research experience studying variable stars using a specially designed curriculum guide "In the hunt for variable stars". Ninety high school students participated in a target instructional sequence and their attitudes and knowledge were compared to 50 students in a comparable science course who were not provided such an authentic research experience. The results revealed that there was significant increase in science content knowledge among students in the intervention group as compared to students in the non-intervention group.
Simpson and Oliver (2010) conducted another longitudinal study on more than 4000 students in grades 6-10. These students were selected from 178 science classes. The results of this longitudinal study showed that male students had significantly more positive attitudes towards science and that their achievement in science was higher than their female students.

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 some interactive review exercises that were developed as the online learning component for an existing native plant landscaping course. The instruments were designed to enable students to 1) test their plant identification knowledge, 2) practice leaf terminology with specific plant samples, 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 captured for each of Florida's major ecosystems in conjunction with sets of plant combinations and site characteristics. Students selected the appropriate choices and submitted their answers online, after which they received immediate feedback. Students reported an improvement in plant
recognition after they had access to these identification tools. These interactive learning tools not only benefit students enrolled in this specific course but can be adapted to a variety of online courses nationwide.

David M.R., Chikte, U.M.E., and Halperin, M.L. (2011) have attempted a study on “Development and Evaluation of a Multimedia E-learning Resource for Electrolyte and Acid-base Disorders”. Their article reports the development and evaluation of a Web-based application that provides instruction and hands-on practice in managing electrolyte and acid-base disorders. The Electrolyte Workshop was developed using Flash and followed an iterative design process. Two case-based tutorials were built in this first phase, with one tutorial including an interactive treatment simulation. Users select from a menu of therapies and see the impact of their choices on the patient. Appropriate text messages are displayed, and changes in body compartment sizes, brain size, and plasma sodium concentrations are illustrated via Flash animation. Challenges encountered included a shortage of skilled Flash developers, budgetary constraints, and challenges in communication between the authors and the developers. The application was evaluated via user testing by residents and specialists in internal medicine. Satisfaction was measured with a questionnaire-based on the System Usability Scale. The mean System Usability Scale score was 78.4 +/- 13.8, indicating a good level of usability. Participants rated the content as being scientifically sound; they liked the teaching approach and felt that concepts were conveyed clearly. They indicated that the application held their interest, that it increased their understanding of hyponatremia, and that they would recommend this learning resource to others.
Lin and Atkinson (2011) investigated the potential benefits of using animation, visual cueing, and their combinations in a multimedia environment designed to support learners’ acquisition and retention of scientific concepts and processes. They found that participants provided with animations retained significantly more concepts than their peers provided with static graphics and those afforded visual cues learned equally well but insignificantly less time than their counterparts in unused conditions.

2.5. STUDIES ON SELECTED INSTRUCTIONAL APPROACHES LIKE MULTIMEDIA, MASTERY LEARNING, LABORATORY METHOD WITH REFERENCE TO ACHIEVEMENT IN SCIENCE - INDIA

Remadevi S. (1998) study on the application of information processing models showed that the concept attainment model was more effective than traditional methods in teaching Chemistry at the secondary and the higher secondary level.

Sreelekha and Nayar (1998) examined the effectiveness of the concept attainment model in learning Chemistry at secondary school level. From the ‘t’ test analysis, the study revealed that the concept attainment model was more effective in improving the overall level of achievement of students in Chemistry and the concept attainment model was also found to be effective in enhancing the application skills with respect to Chemistry.
Ravi (1998) conducted a study on the relationship between school facilities and achievement in science were that, there is significant relationship between physical facilities, academic facilities and student achievement in science. There is a significant association between schools with high and low physical facilities and student achievement in science.

Avtar (2000) analysed the difficulties faced by teachers in conducting practical work in schools. According to him, the difficulties are mainly due to the following reasons; (1) Non-availability of proper laboratory facilities in schools,(2) Non-availability of science equipment or apparatus or materials, (3) Lack of ability to improvise and (4) Unwillingness on the part of teachers.

Lakshminarayana and Sreekala (2001) conducted a study on the factors, process skills in science and understanding of science. The study showed that there is a relation between science application ability and science understanding and the science application ability is related to science process and high process skill groups are showing higher ability to apply science in daily life.

Sharma R.D., and Sansanwal D.N. (2002) compared 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 finding was that the treatment had a significant effect on achievement in Science, of students belonging to different video-based instructional strategies for teaching Science.
Vaikunthavasagam (2002) studied the impact of multimedia on achievement in science at the primary level. He concluded that the impact is very high. It was found that if multimedia materials are developed for all the competencies for all classes, then there will be better achievement at the primary level.

Anna Raja and Felcia Persis Rani (2003) developed a Computer-Animated package in biology and found out the effectiveness of a computer animated package in teaching biology to VIII standard students. They used Power Point for developing a computer-animated package in biology. Each slide was designed for a specific topic, the investigators developed a computer-animated package with various animation effects like appear, fly, swivel, spiral etc., and the slides were presented with the help of a multimedia computer. The ‘t’-test results indicated that the experimental group is better than the control group with regard to achievement in biology.

Malliga, T. (2003) studied the relative effectiveness among different strategies of Computer Mediated Multimedia Presentation in Teaching and Learning of Chemistry at Higher Secondary Stage. To study the relative effectiveness among PBL(Peer-based Learning), ILMMP (Individualized Learning supported by Multimedia Presentation), and IILMMP (Interactive Individualized Learning supported by my multimedia presentation) in terms of development of cognitive skills at different levels of knowledge, understanding and application among students of class IX, quasi-experimental design was adopted for the study. The results of the study indicated that the enhancement of learning chemistry was only due to media effectiveness, and suggested that Computer Mediated multimedia-based instruction
was found to be the most effective strategy to upgrade of cognitive skills, knowledge, understanding, and application in realizing the instructional objectives in chemistry at class IX, and it can be introduced in education.

Talwar and Sheela (2004) investigated the effectiveness of Synectics model of teaching science on creativity and problem solving skills of secondary school students. The results showed that Synectic model was more effective in developing creativity and problem solving ability among students.

Arulsamy, S. (2005) compared the effectiveness of interactive multimedia CD-based learning with that of conventional teaching methods with science group students. The sample for the study consisted of 50 learners from the XI standard of Sri N. Krishnrajulu 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.

Benjamin Edward William, A. (2007), compared the effectiveness of interactive multimedia CD-based learning with the conventional teaching method with the Science group students. The sample of the study consisted of 48 learners in the XI standard of Blessed Mother Teresa Model Higher Secondary School, 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 that the interactive multimedia CD-based learning prepared by the teacher could show immense impact in the learning of physics. Further, the
experimental group has expressed a more favourable attitude towards the interactive multimedia CD-based learning courseware.

**Jagannath K Dange (2008)** developed a CAI package on five units pertaining to the environment in the Science syllabus prescribed for the 8th standard in the Karnataka State syllabus. After administering a pre-test he taught a sample of 30 students these units with the package for a period of one and half month and conducted a post-test. The results indicated that the CAI package has made for a statistically significant gain in attitude and awareness scores of the sample.

**Paltasingh (2008)** inferred that there was significant difference between the effects of synectics model and traditional method of teaching life science in development of creative thinking ability of students. The students gain through the implied training in creativity synectic model produced significantly higher achievement in science.

**James, A and Marice, P.V (2009)** conducted a study entitled, "Achievement in science as related to scientific aptitude and scientific attitude among XI standard students in Tamilnadu". The purpose of this study was to explore the relationship among the variables namely achievement in science, scientific aptitude and scientific attitude. The sample constituted 470 students of standard XI from 10 schools of Coimbatore District in Tamilnadu. The tools used were standardized science attitude scale prepared by Mrs. Avinash Grewal (1977); standardised scientific knowledge and aptitude test prepared by Chatterji and Manjule Mukerji (1964). The findings showed that students hailing from rural and urban areas have similar scientific
attitudes and same type of academic achievement in science. Students from matriculation and state board schools differ in their scientific attitude, favoring students from matriculation schools. Achievement in science and scientific attitude are found to be significantly associated with school type.

**Kalani (2009)** conducted a study on aimed at investigating relative effectiveness of concept attainment model and conventional method of teaching on achievement and retention of students. The study showed that concept attainment model was more effective than conventional method on attainment of concepts in science and in the retention of concepts.

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

**Nimavathi and Gnanadevan (2010)** conducted a study entitled, "Impact of multimedia for the development of favourable attitude towards science". The sample consisted of 60 secondary school students of ninth standard at Pudukkottai district. The tools used were multimedia programme for teaching biology and attitude towards science scale (Sugumaran Nair and Shobanadevi). The pre-test and post-test
equivalent group design was followed for this study. The data has been subjected to descriptive and differential analysis. The findings revealed that there was significant difference between control and experimental group. This clearly showed that the students learning with the help of multimedia will increase the favorable attitude towards science than the students learning through the conventional method.

*Amutha, S. (2011)* investigated the effectiveness of designing e-content with a metacognitive instructional design (model) on science teaching competence of 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 student-teachers of science to learn an innovative teaching technique for teaching science concepts using meta-cognitive instructional design.

*Mukherjee (2011)* investigated the effectiveness of concept attainment model (CAM) in terms of achievement in science of class VIII. The results of the study indicated that CAM was effective in terms of achievement of students in science.

*Usman Ali (2014)* has written an article on the topic “The effect of modern techniques of teaching in solving the problem in the subject organic Chemistry”. The population of the study consisted of 100 students of XII standard students studying organic Chemistry. The material prepared for the students of experimental group to implement the modern teaching technique was used. Results revealed that, a better
performance of the experimental group. Hence application of the modern techniques in clearing the difficulties faced by the higher secondary students in the subject organic chemistry was effective.

2.6. STUDIES ON SELECTED INSTRUCTIONAL APPROACHES LIKE MULTIMEDIA, MASTERY LEARNING, LABORATORY METHOD WITH REFERENCE TO ACHIEVEMENT IN PHYSICS - ABROAD

Marsh, (1987) in his reports show that students’ evaluations of the efficiency of the teaching are commonly used to understand the quality of the teaching methods used as well as students’ satisfaction with learning Physics.

FCI, Hestenes, Wells & Swackhamer, (1992); FMCE, Thornton & Sokollof, (1998), Redish & Steinberg, (1999) evaluated through the effectiveness of specific conceptual learning, in such as “detailed student interviews”, “open-ended examination problems” and they used these instruments, to show that methods like concept mapping or drawings also help students to improve conceptual learning. Literatures in Physics education show that diagnostic tests have been commonly used to spot students’ conceptual learning and conceptual misunderstandings over the last 20 years.

Huffman (1997), conducted a study to determine the effects of teaching explicit problem-solving strategies in Physics teaching at high school level on student’s conceptual learning skills through three open-ended questions related to FCI and Newton’s laws, concluded that there was no significant difference between the strategy teaching group and the control group. As a way of monitoring and improving the quality of teaching, student evaluations have become a part of life at
According to Kwan (1999), these evaluations are used as one measure of teaching effectiveness.

**Huffman, (1997)** conducted a study on although there are some studies claiming that teaching learning strategies has no influence on students’ conceptual learning, many studies verify that teaching learning strategies has a positive effect on students’ conceptual learning. For example, Gaigher et al., 2007 investigated the effects of structured problem-solving instruction on students’ problem solving skills and conceptual understanding of Physics and revealed that the structured problem-solving group showed better Physics conceptual understanding and tended to use a more conceptual approach in problem solving.

**M.H. Tinker, R.J.A. Lambourne and S.A Windsor (1999)** explored “Flexible learning approach to Physics- A review after the first two years”. The research explicitly dealt with student’s misconception. It was designed to suggest conditions in which misconceptions could be replaced by scientific conception and new conception in which misconception could be integrated with existing conception. The results showed that conceptual change text accompanied with concept mapping instruction caused a significantly better acquisition of scientific conception related to solution concept and produced significantly higher positive attitudes toward science as a school subject than the traditional instruction.

**Haack (2000)** made an attempt to study on scaffolded problem-solving, learning approaches and understanding of concepts in an introductory college Physics class. Results showed that students who did scaffold problems attained
significantly greater understanding of Physics concepts than students who did non-scaffold assignments.

*Zienneddine and Abd-El-Khalick (2001)* assessed the effectiveness of concept maps as learning tools (or strategies) in developing student’s conceptual understanding in a Physics laboratory course, and explored student’s perceptions regarding the usefulness of concept maps in the laboratory.

*Eryilmaz (2002)* investigated the effect of conceptual assignments and conceptual change discussions on high school students' achievement and misconceptions about force and motion. Pretest and posttest data were analyzed using the Force Misconception and Force Achievement Tests (FMFAT) and discussed the effects on the conceptual change discussion on reducing misconceptions students held as well as improving students' achievement in force and motion were discussed.

*Zacharia Zacharias and O. Roger Anderson (2003)* carried out a study titled “The effects of an interactive computer based simulation prior to performing a laboratory inquiry based experiment on students’ conceptual understanding of physics”. They investigated the effects of interactive computer-based simulations which are presented prior to inquiry based laboratory experiments on students’ conceptual understanding of mechanics, waves or optics and thermal physics which enhances the subsequent more open ended inquiry learning in the subject matter domain of the experiments, were integrated into a one semester class for prospective physics teachers who served as students in the study. Semi-structured interviews were used to assess their ability to make correct predictions about the phenomenon
in the experiments and give correct explanations of the discrepancies between their predictions and their following observations conceptual tests were presented to assess conceptual understandings of each topic. Research findings indicate that the use of the simulations improved the students ability to make acceptable predictions and explanations of the phenomena in the experiments. The use of simulations also fostered a significant conceptual change in the physics content areas that were studied.

*Onder (2006)* compared the effectiveness of conceptual change approach and traditional method and also determined misconceptions students hold about solubility equilibrium on tenth grade students’ understanding of solubility equilibrium concept.

*Patrick W. Wambugu and Johnson M. Changeinwo (2008)* studied effects of Mastery Learning approach on secondary school students’ physics achievement. The effects of Master teachers in the experimental groups on the technique of MLA before the treatment. Pretest was administered before treatment and a post test after three weeks treatment. The instrument used in Learning Approach (MLA) on students, achievement in physics was found. Researchers trained the the study was physics achievement test (PAT) to measure students’ achievement.

*David E. Meltzer (2011)* studied active learning instruction in physics. These are instructional methods that are based on, assessed by, and validated through research on the teaching and learning of physics. They involve students in their own learning more deeply and more intensely than does traditional instruction, particularly during class time, Research findings discuss a range of methods for
introducing active learning instruction in physics and provide references to those methods for which there is published documentation of student learning gains.

*Warrewessel (2011)* studied instructional approaches in teaching physics. Student learning in grade 12 physics is complex process and causes frustration for teachers and students. Research findings provide a different picture of student learning and different strategies for teaching physics. The recommendations are aimed at changes required for improvement in student performance in physics and science in general.

*Gulbinozkan (2012)* studied how effective the conceptual change approach in teaching physics. Both at home and abroad, the majority of studies carried out in teaching physics are about student’s misconceptions and ways of overcoming this problem. These results from the fact misconceptions are the most significant factor that negatively contributes to students’ academic success. It has recently been observed that most studies discuss the process of “conceptual change approach” so as to eliminate the misconception problem and improve students’ learning. Research findings presents some studies that have proven the effectiveness of conceptual change strategies in recovering students’ misconceptions.

### 2.7. STUDIES ON SELECTED INSTRUCTIONAL APPROACHES LIKE MULTIMEDIA, MASTERY LEARNING, LABORATORY METHOD WITH REFERENCE TO ACHIEVEMENT IN PHYSICS - INDIA

*Kanniyakumari (1990) & Sood (1990)* found that Concept Attainment Model positively influenced the achievement of students. *Singh (1990)* found that both the models, concept attainment model and inquiry training model were equally effective in the learning of Physical Science at IX class level.
**CBSE (1991)**, conducted a study on Physics investigatory project is a problem based act carried to completion in its natural setting to achieve the intended objective: It is an independent study or mini research or open-ended work. Unfortunately to most teachers, a physics project means building a gadget or displaying an instrument of physics. The reason for this state of affairs is the lack of preparation on the part of teachers and non-availability of enough resource material on physics investigatory projects at the school level.

**Jeyamani, P. (1991)** carried out a study on Computer Assisted Instruction in teaching Physics for IX Standard Students. He revealed that the experimental group received the CAI as treatment and after the experiment it was found that the experimental group performed better on the post test. The differences were insignificant irrespective of sex and medium of instruction.

**Chauhan (1992)** in his study on helping the underachievers in science suggested that teachers should adopt appropriate methods to help underachievers in science and science teachers need to provide activities and experiences which are purposeful, interesting to the level and that are reflective in nature.

**Pandey (1993)** conducted a study to find out the relative importance of Piagetian reasoning, general intelligence and achievement motivation for concept attainment in Physics. The results showed that reasoning and general intelligence were very important for predicting the attainment of Physics concepts.

**Jayakumari (1997)** determined the effect of concept attainment model on achievement in Physics and concluded that it was more effective than the traditional method in teaching Physics.
Rangaraj K.R. (1997) developed a syllabus-based computer software package in teaching physics at higher secondary level and studied the effectiveness of computer-assisted instruction in teaching physics at the higher secondary stage. The analysis of data revealed that there was a significant difference between the means of the pre- and post-test in physics among the controlled and two experimental groups at all the levels of cognition in favor of the post-test.

De, Kamal Krishna (1999). Conducted a study reported that girls and rural students showed notable deficiency in concept attainment and the performance of boys on concept test was better as compared to girls. Achievement in Physical Science was found to have high positive correlation with scores on the test of concepts in physical science.

Sidhu and Singh (2005) made an attempt to compare Concept Attainment Model (CAM), Advance Organizer Model (AOM) and conventional method in teaching Physics in relation to intelligence and achievement motivation on scholastic achievement of students for learning concepts in Physics. The results indicated that there was no significant difference among various teaching techniques, intelligence and achievement motivation on scholastic achievement of students in learning concepts in Physics.

Johnson (2006) studied the effectiveness of interactive multimedia approach over the conventional method in teaching physics for XII Standard students. The experimental method was used. The total sample was 80. The sample was XII students of Blessed Mother Teresa Model Higher Secondary School in Pondicherry. The researcher used the ‘t’ test score to find out the difference between the pre-rest and post-test. He found that there was a significant difference
between the experimental group and the control group in their achievement in the post-test. He also stated that multimedia approach makes the teaching learning process effective and enhances mastery level over the subject.

**Jebaraj, G.P., and Mohanasundaram, K. (2008)** developed web enabled e-content on teaching of physics at the Tertiary Level which included the following objectives: (i) to develop and validate an e-content on the “Solar System” (ii) to find the effectiveness of e-content on “Solar System” in teaching beyond cognition at the tertiary level, and (iii) 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 control groups differ in their achievement.

**Aravindan, S. and Ramganesh, E. (2010)** investigated the effectiveness of e-content in concretizing the concepts of physics among 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. 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 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 content experts and user satisfaction on learning. The collected data subjected to appropriate statistical analysis, revealed that e-content will certainly be 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.

**Manisha Bajpai (2013)** studied effectiveness in developing concepts in physics through virtual lab experiment. Physics learning, labs plays very active and significant role as it is essential to develop concepts and principles because students are continuously required to by identify the hidden concepts define and explain underlying laws and theories using high level reasoning skills. Research findings of the present study clearly revealed that student learned concepts of photoelectric effect through virtual lab in a better way as compared to real lab. The study also
suggested the use of virtual labs in physics teaching, especially for teaching of concepts.

Binuraj, A. et al. (2014) investigated on the topic “Construction and Validation of individualized audio instruction material for enhancing teaching of Physics”. All the high school students with Malayalam as medium of instruction studying 8th standard undergoing the Kerala State Syllabus was selected for the study. The investigator constructed Individualized audio material (a package type) on the areas “magnetic effect” and “Current electricity” were used as tools. The results revealed that Individualized audio material based teaching is effective in teaching Physics.

2.8. SUMMARY OF REVIEW OF RELATED LITERATURE

(2013), Maree, Ton J.; van Bruggen, Jan M.; Jochems, Wim M. G. (2013), Palilonis, Jennifer; Butler, Darrell; Leidig-Farmen, Pamela (2013), Rusanganwa, Joseph (2013), and Intakhab Alam Khan (2014) did their studies on selected instructional approaches like multimedia, mastery learning, laboratory method with reference to achievement in other subjects abroad.


Some researchers have done their studies on selected instructional approaches like multimedia, mastery learning, laboratory method with reference to achievement in Physics in India. They are Kanniyakumari (1990) & Sood (1990),

2.9. CONCLUSION

Successful instructional strategies help students to process new contents effectively. It will activate students motivation and meet their expectations. An examination of related studies points out that a proper blending of diverse instructional patterns would enhance the quality of learning. The responsibility of the teacher in the new millennium is to provide an appropriate learning environment for self-learning. Hence, teachers should master and use the diverse teaching approaches to suit various learning situations and thereby empower the learners. The review of literature is one of the important steps of research. It enables the researcher to identify the research gap of the study, to conceptualize the variables, to formulate the hypothesis and to select the suitable methods and tools. The research studies conducted in India enabled the researcher to test the knowledge of the higher secondary students about the units of the various quantities in Physics, mathematical background in Physics and how to attain success in making use of the teaching aids in the understanding of abstract concepts in Physics through composite instructional approach.