2.0 Introduction

Review of related literature provides an empirical framework to carry out further study. It helps to get insight of the problem by studying the past research work which already has been done and provides a direction for type of work required to be done in future. It provides an orientation to research regarding type of research that has been conducted in the field previously. It is necessary that the researcher is aware of the knowledge generated and ongoing process of knowledge generation for better clarity of problem and an insight into its methodology issues. For any researcher, review forms the basis for the problem under investigation and helps researcher to arrive at the proper perspective of the study.

Reviewing study is an attempt to give a brief sketch of researcher carried out in the field of technology and multimedia. Sources used were Survey in Education, Dissertation Abstract International, Internet and educational journals etc.

Review work for this study is divided into four parts:

- Studies related to Utility of Different Media in Teaching Learning
- Studies related to Technology Integration in Teaching-Learning
- Studies related to Attitude of Student-teachers on ICT Integration
- Studies related to ICT Skills

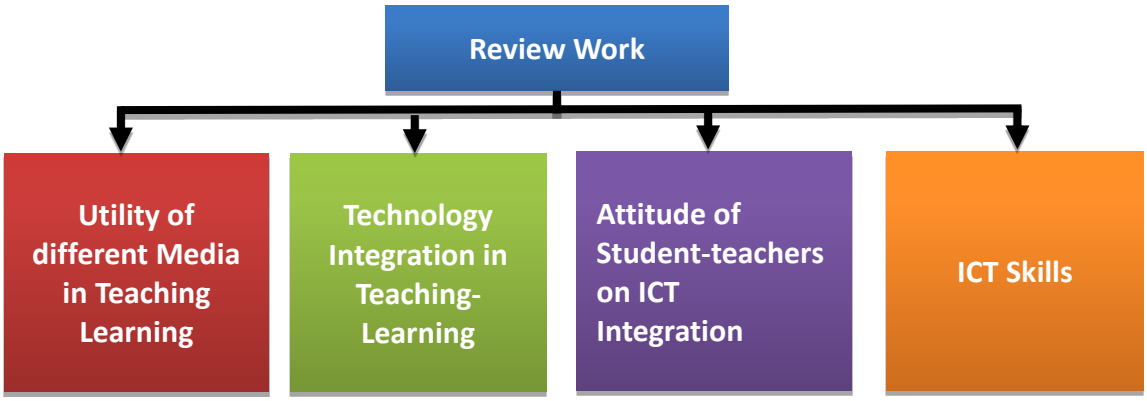

Figure 2.1

Categorization of Studies conducted by the Researcher

2.1 Studies related to Utility of different Media in Teaching Learning

This section of review explores utilization of different media particularly in the form of Computer Assisted Instruction (CAI), Computer Assisted Learning Management (CALM), Computer Aided Language Learning (CALL), and Computer Managed Instruction (CMI), audio-video media, Computer Based Multimedia Leaning Package (CBMMLP), animation, e-learning approach, online learning and multimedia. Researches across the globe influenced by ICT provide an evidence of improvise integration of ICT all the way from primary level to tertiary level. This section explores some of these evidences of effective utilization of different media in teaching learning. Studies related to all this media richness in teaching learning elaborated as follow:

2.1.1 Studies Related to Computer Assisted Instruction

Researchers from different part of the globe studied effectiveness of computer assisted learning in variety of subjects like Languages, Science, Mathematics, Technology, Engineering and others. On the basis of integration of computer based instruction in subject, it may vary in nomenclature like Computer Assisted Learning (CALM), Computer Aided Language Learning (CAiLL), and Computer Managed Instruction (CMI) etc. Researcher comes across following studies in this regard:

Dalton & Hannafin (1986) studied effect of video-only, CAI only, and interactive video instructional systems on learner performance and attitude. Based on pre-test scores, students were randomly assigned to the three treatment groups. On conclusion of a lesson students were given a print-based post-test and a survey to assess their attitudes toward the instruction. Analysis consisted of a completely crossed 3X2X2 treatment by achievement by sex factorial design, featuring three levels of prior achievement (high, average, and low). The means for the treatment groups on the performance measure were 64.98%, 73.54%, and 70.48% for the video, CAI, and interactive video treatments respectively; attitude scale means measured 75.07%, 74.26%, and 82.87%. Results indicated that CAI alone tends to be the most effective instructional delivery system where the additional capabilities provided by interactive video are not required. However, interactive video instruction did produce significant

improvements in the attitudes of low ability learners when compared with CAI and video.

Kadhiravan (1999) studied difference amongst three instructional strategies viz. Lecture Method (LM), Computer Assisted Instruction (CAI) as individualized strategy and Computer Assisted Instruction with Peer Interaction (CAIPI) in terms of their effectiveness in improving the performance in Physics among higher secondary student. Statistical techniques like quasi experiment design, SD, ANOVA and t-value were used to analyze the data collected. Findings of the study revealed that (i) among the instructional strategies, viz. LM, CAI and CAIPI, CAIPI was the most effective instructional strategy in terms of realizing the instructional objectives in physics at higher secondary stage. (ii) There was a differential effect on the cognitive development of the students in physics due to their use of self-regulated learning strategies.

Karia (2001) studied effectiveness of Computer-Aided Learning (CAL) program with a major objective to develop program learning material and computer aided learning program for the unit 'Set Theory' in mathematics of standard VIII and to study the effectiveness of Computer Aided Learning (CAL) program in relation to program learning and traditional instructions. Researcher administered teacher made post-test to collect the data. The data were analyzed with the help of analysis of covariance. Major findings of the study were- (1) Traditional method of teaching and Computer Aided Learning program were equally effective for boys. (2) For girls traditional method of teaching proved more effective than CAL program. (3) Program learning material and CAL program were equally effective for both the boys and girls.

Vasanthi & Hema (2003) studied the effectiveness of teaching Chemistry to first year B.E. students through Computer Assisted Instruction over the traditional teaching Method. Achievement test was administered and t-test was used to analyse data. Study revealed that there was a significant difference between the mean gain score of the control group taught through TTM and the experimental group.

Sanjana (2003) compared Computer Assisted Instruction (CAI) and Computer Managed Instruction (CMI) on student's achievement in science, their self-concept and self-involvement. Socioeconomic Status Scale; Raven's Progressive; Self -

Concept Questionnaire (SCQ) a test of self-concept; study involvement inventory; and science achievement test were used as a tool. The data was analysed with the help of t-test. Major findings of the study were: (1) The group of students who were taught science through Computer Assisted Instructions showed significantly higher mean gain score in achievement than the group of students who were taught science through traditional method. (2) The mean gain score of the group of students who were taught science through Computer Managed Instructions were found to be significantly higher in achievement than the group of students who were taught science through traditional method.

Singh (2005) studied effectiveness of CAI in Biology subject at secondary level. Major objective of the study was to compare the effectiveness of Computer Assisted Instruction (CAI) as compared to lecture method on the topic 'Tissues and Cell'. The researcher used achievement test and t-test. Result of the study were (i) Both the methods were effective in enhancing the learning about cell and tissues. (ii) While lecture method was found to be more effective than CAI for teaching cell, CAI was more effective then lecture method for teaching tissues.

Dange & Wahb (2006) conducted a study to find out the effectiveness of teaching Physics for class IX through Computer Assisted Instructional Package of "Universe". The researchers adopted quasi experiment design. t-test was used to analyse data from control and experiment group students. There was a significant difference between mean gain scores of post- test of control and experimental group.

Kundu (2008) studied the effectiveness of CAI in Mathematics at secondary level. Objectives comprised study of the effectiveness of computer aided instruction program as compared to the traditional method and study the reactions of the students about computer aided instruction program. Study was quasi-experimental typed and researcher used achievement test and reaction scale. The CAI package proved to be effective in terms of the students' academic achievement. Students had positive attitude towards learning through computer assisted multimedia package.

Patel (2008) developed computer assisted instructional package on two units of Physics for XI Science student studying GSTB syllabus and study the effectiveness of the CAI package in terms of achievement. Researcher used achievement test and

opinionnaire to collect data. T test and chi-square test was used as a data analysis techniques. The CAI package was found significantly effective for the students of class XI of both the groups. Study also revealed that CAI was found to be more effective in terms of achievement scores as compared to the traditional method.

Badiyani (2008) compared effectiveness of Computer Assisted English Language Learning Package and Computer Aided English Language Learning Package on experimental group I(CAiLL package group), experimental group II (CAsLL package group) and control group (No instruction group). The research design was 'Three equivalent groups only posttest design'. Achievement test and opinionnaire were used to measure the effectiveness of package in terms of achievement of students in unit 'Action Verbs' of English grammar and opinions of the students towards the CAiLL package and the CAsLL package respectively. One way ANOVA, tuckey test and chi-square techniques of statistics were used to analyses data. Major findings were: (1) CAiLL Package and the CAsLL package each was found effective. (2) CAsLL package proved to be more effective than the CAiLL package. (3) The CAiLL package and the CAsLL package were also effective in evoking positive reaction towards the use it.

Maheta (2009) studied effectiveness of CAI at primary level in terms of academic achievement of students and also studied students' reaction towards learning through package. Study was quasi-experimental typed and researcher used achievement test and reaction scale. T-test and chi-square were used as data analysis techniques. Study revealed that the Computer Assisted Instruction (CAI) program in Mathematics significantly better than the traditional method.

Sritaratorn & Sombunsukho (2011) studied effectiveness of CAI package for a multimedia program. Study focused on the efficiency of the package; the effectiveness of learning using package; and learners' satisfaction of learning. Achievement test and questionnaire were used. T-test and mean were used to analyse data. Result revealed that the computer instructional package for the multimedia program was good enough to be used for self-study.

CAI has its application in various school subjects like science, mathematics, languages, social science etc. Though level of impact of learning through CAI in

different subjects varies but it has been found to be more or less effective in terms of students' academic achievement and at different level of education.

2.1.2 Studies Related to use of Audio-Video, Animation in Education

Researchers across the globe have carried out studies regarding use of audio, video media as ICT tools. Researcher reviewed those studies and are presented below:

Singh (1995) developed video instructional package for teaching environmental awareness at school level. The study reported that students enjoyed working through video package and intra and inter-disciplinary networks be developed to enhance research collaboration between students and teachers.

Ilaangovan (1998) undertook a study on effectiveness of audio-video intervention to develop listening comprehension in English. Researcher compared effectiveness of Conventional Teaching Method (CTM) with Media based Non Interactive Group Teaching (MNGT) and AV Presentation as Support System (AVPSS). It was found that MNGT was more effective as compared to CTM. AVPSS was more effective in enhancing retention of listening comprehension.

Stith (2004) conducted a study on animation-based teaching in Biology. Major objective of the study was to compare animation based teaching with lecture sections without the supplemental animation. Study comprised of post-test experiment design. Quiz was used to collect data. Two tailed unpaired t-test and F-test were used to analyse the data. Result said that lectures using animation lead to more complete understanding of certain cell biology concepts than lectures that use only static illustrations.

Karem (2009) explored e-learning for the effective teaching. Major objective of the study was studying effectiveness of the e-learning component of the project including the smiley approach to illustrate the cellular basis of life. Study was survey type. Twenty students were interviewed as well as discussion was carried out to collect data. Data was analysed with the help of percentage and frequency. Major observation of the study was that e-learning component of the project including smiley face approach was very useful. The majority of interviewees agreed that the lessons were useful. The external links and visual demonstrations used were very useful to the

students. An expert from the Technology Information Centre mentioned that the approach used was very useful.

2.1.3 Studies Related to Multimedia

Many researches have been carried out related to effectiveness of multimedia in teaching learning. Few researches already focused on effectiveness of multimedia package including OHP transparencies, animation, cartoon, powerpoint slide show in the area of languages, science education, mathematics, geography, history etc. Studies also focused its utility as a self-learning instruction material for better learning. Followings are the studies related to above-mentioned areas:

Menon (1984) used multimedia approach to teach at postgraduate level. Major objectives of the study were 1) to develop a multimedia strategy in organizing a course in educational technology for postgraduate and research students and 2) to validate the study in terms of achievement of students in the criterion test, performance of the students in discussion component of the strategy and attitude of students toward multimedia approach. The sample of the study was 15 M.Sc. students, 21 M.Ed. students and 8 research students. Tools used for data collection were criterion test and performance in discussion session. F-value of the study shown that English reading comprehension had influenced the academic achievement. Multimedia strategy had been able to nullify the effect of intelligence on achievement. The multimedia strategy reduced cost of the course.

Colon et al. (2000) developed multimedia package for teaching critical quality research. Researcher used a constructivist instructional design model, R2D2, to develop a package. The purpose of this study was to qualitatively create an instructional product using a hypertext system derived from cognitive flexibility theory. Research has shown that multimedia-based learning was effective in terms of achievement**.**

Bhutak (2004) studied effectiveness of multimedia package in the subject of science for class nine. The multimedia package was developed in three parts, (1) learning by power point slide show, (2) self-study material and (3) learning by transparencies through overhead projector. Major objective of the study were to develop a multimedia package for subject science of standard IX and to study the effectiveness

of multimedia package with reference to achievement test in science and retention of learning. Researcher selected two groups control and experimental group for the study. Researcher employed posttest and an opinionnaire as tools. Major findings of the study were: (1) multimedia package was more effective in terms of achievement and retention of science for both the groups of girls and the boys separately and jointly and (2) self-study material was more effective than slide show for girls, while slide show proved more effective than self-study material for boys**.**

Jayaraman (2006) studied the relative effectiveness of Computer Based Multimedia Leaning Package (CBMMLP) on performance and behaviour outcome of students of different age of class V, VIII and XI. Researcher used quasi-experiment design and survey method for the study. Tools used for data collection were achievement test and questionnaire. Data analysis was done with the help of ANOVA. Major Finding of the study was the Performance of the students higher than the performance of the students who have learnt through CBMMLP.

Patil (2006) studied effectiveness of multimedia instructional system for B.Ed. student-teachers on computer education. Major objective of the study was to compare effectiveness of constructed multimedia system with non-conventional teaching. F-test and t-test were used for data analysis by the researcher. There were significant difference between the performance of the student-teachers of control group and experimental group on post-test. Thus, multimedia package was to be found effective.

Shikhare (2007) developed multimedia instructional system for B.Ed. students teachers on educational technology. The Major objectives of their studies were to test and compare effectiveness of constructed multimedia system. F-test and t-test were used for data analysis by the researcher. Significant difference was found between the performance of the student-teachers of control and experimental group on post-test, which indicates effectiveness of multimedia package.

Junaidu (2008) conducted a study on multimedia based teaching & learning. Major objective was to study effectiveness of multimedia in learning & teaching data structures online by using Ellis's model. Study was analytic study and assessment was done based on students' performance in assignments and examinations. Study revealed that there was improvement in learning ability with the help of multimedia.

Singaravelu (2009) carried a study on multimedia effectiveness on students of standard V in learning Tamil vocabulary. Major objective of the study was to compare learning Tamil vocabulary through conventional method and multimedia package. Researcher adopted quasi experiment design. Researcher used achievement test as a tool and t test as a data analysis technique to analyse collected data. Result revealed that learning vocabulary in Tamil through multimedia package was more effective than conventional methods.

Crary (2010) studied student performance on end-of-lesson assessments after viewing a multimedia-based lesson in the Microsoft excel software application. Multimedia-based animated demonstrations were used as an instructional strategy for teaching computer software procedures. Objective of the study was to study student performance on end-of-lesson assessments after viewing a multimedia-based lesson in the Microsoft excel software application. The researcher used two groups post-test experiment design. Achievement test was administered on both the group and data was analysed using t-test. Results showed that performance of all students significantly improved from pretest to posttest with the use of animated demonstrations. Study also revealed that students who participated in guided practice with the animated in guided demonstration improved significantly.

George (2011) designed multimedia information package to develop environmental awareness among student-teachers at secondary level. Study had pre-experimental design. Researcher used questionnaire as a tool. T-test was applied on collected data and frequency was counted for the statements in questionnaire. The study revealed that multimedia was found to be very effective in developing awareness about various aspects of environmental science among student-teachers at secondary level.

Richard (2011) analyzed the impact of multimedia resources from discovery education on science achievement of fifth and eighth grade students in Charlotte-Mecklenburg Schools over a three year period of time. The end of grade science exam results of over 60,000 students was compared to teacher and student usage of discovery education streaming and discovery education science from 2007 through 2010. The results indicated that during some school years the use of the media resources led to increased student achievement in science, while in other years the

data indicated that student achievement in science was not impacted or impacted in a negative manner.

Noordin, Ahmad & Hooi (2011) studied effectiveness and usability of multimedia courseware integrated with 3-Dimensional model as a teaching aid for teaching a mathematical topic on lines and planes. A field study with experimental approach was carried out on randomly selected students. Result shown that, the latter group showed significant improvement in attention, response and recall of the content.

Nusir et al. (2012) investigated impact of utilizing multimedia technologies at early stages in Jordanian primary schools. The researchers used quasi experiment research design. Achievement test was used as main tool for data collection. Researcher used t test and ANOVA to annalyse collected data. Results showed that multimedia enhanced method of teaching was effective in getting students' attention, especially when used cartoon characters. Results also showed that there was no significant difference in learning and knowledge skills and information absorption based on gender distribution.

Pimpale & Vadnera (2012) studied effectiveness of digital interactive multimedia package in Astronomy. Major objective of the study was to study effectiveness of digital interactive multimedia package in astronomy to inculcate scientific values among the tertiary level students in India. Achievement test was used as a tool and t-test and ANOVA were used as a data analysis technique. Study revealed that the students, who were exposed to the multimedia package, did significantly well compare to those who were given only the print material.

Piyayodilokchai et al. (2013) conducted a study on interactive multimedia based teaching & learning. Major objective of the study was to investigate the students' learning achievement and attitude on SQL after participating in the learning unit based on 5E learning cycle model supplemented with interactive multimedia. Study was experimental typed. Achievement test, questionnaire, rubric were used by the researchers to collect data. Percentage, frequency were used to analyse collected data. Study revealed that the students who participated in this developed instructional unit had better ability to apply SQL to a database compared to other groups of students.

Singh (2013) used multimedia package to teach geography for standard IX CBSE students and studied its effectiveness. Major objectives of the study were 1) to study the effectiveness of multimedia package in the terms of achievement of students and 2) to study the effectiveness of multimedia package in terms of reaction of students towards the developed multimedia package. Researcher used an achievement test and a reaction scale to collect information. Major findings of the study were 1) The developed multimedia package was found to be significantly effective in terms of enhancing students' achievement in geography in comparison to the traditional approach and 2) The developed multimedia package to teach geography was also found effective in terms of the reaction of students towards the package.

Kaptan (2014) studied effectiveness of cartoon and comic based multimedia package for teaching environment to primary school students. Study covered objectives 1) to study the effectiveness of the developed cartoon and comics based multimedia package in terms of the achievement of primary students in environment, and 2) to study the effectiveness of developed cartoon and comics based multimedia package in terms of the reaction of primary students. Study was of quasi-experimental design and achievement test was used as the main tool to collect data. The findings shown that the developed cartoon and comics based multimedia package was more effective than the traditional method of teaching in terms of achievement and delayed achievement of students in environment. Students found learning through cartoon and comic based multimedia package favorable.

Irudayam (2015) studied effectiveness of multimedia package to teach Biology to Std. XII Students. Major objective of the study was to study the effectiveness of the multimedia instructional software package in terms of reactions of the students towards biological sciences through multimedia package. Quasi-experimental design was employed by the researcher. Achievement test and reaction scale was used to collect data. Researcher used t test and chi-square to anlyse collected data. Major finding of the study was that 1) the multimedia instructional software package was found to be effective in teaching biological sciences. 2) the treatment through multimedia software instructional package in terms of reactions of the students towards teaching biological sciences through multimedia instructional software package has been found to be effective.

Major Observations:

- Researcher came across studied related to different forms of media integration across primary to tertiary level.
- Most of studies carried out in India have similar kind of methodology, tools and data analysis techniques. Majority of researchers choose quasi experimental design- control and experimental group pre-test post-test design.
- Tools used by the researchers were achievement test, reaction scale, opinionnaire, etc. Most of researchers used t test, f test to analyse data in terms of achievement of students. Many researchers took gender as variance and used ANOVA, ANCOVA as data analysis technique. Researchers also used frequency, percentage, chi-square to analyses data obtained through opinionnaire, reaction scale. Different studies revealed that different media integrated teaching has positive influence on student's achievement and students found multimedia based teaching learning effective.
- As most of study revealed, there were significant difference in achievement of students in pre-test and post-test via using different media.
- Few studies adopted qualitative approach; many studies followed mixed method approach.

2.2 Studies related to Technology Integration in Teaching-Learning

Information and communication is very vast field and it has significant impact on education. As ICT has different modes and modalities to integrate ICT in teaching learning. Researcher further categorized studies based on mode and modalities in ICT integration. Many Researches have been carried out on different modes and modalities of technology integration in learning. Different researchers used software packages, computer based instruction, drill-practice and simulation, microcomputers, multimedia, multimedia journal, hypermedia, Intel training program 'Teach to the Future', affable reading tutor, online learning, synchronous and asynchronous learning, blended learning, web 2.0 tools, MOODLE module, CDROM, Macromedia Flash MX and lean media e-learning instructional material, distance-learning module etc. to make learning more meaningful. Researcher came across following studies on different modes and modalities of technology integration:

Ferry & Brown (1995) conducted research entitled "Utilization of Multimedia Journal to Enhance a Subject in Technology Delivered to Pre-service Teachers". Major objective of the study was to study utilization of multimedia journal to enhance a subject in technology. It was found that multimedia journals were useful for the professional development of the teachers. Study was of survey typed. Researcher used journal entries, interviews to collect data. The researcher used percentage, frequency, and data triangulation techniques for data analysis. Study revealed that the pre-service teachers had developed their competence and confidence in designing and making skills.

Phoolwala (1997) carried out study at school level. Researcher studied effectiveness of microcomputers in teaching science for standard X for self-learning. Findings of the study were: (i) the difference between the mean scores of pre-test and post-test of experimental group was significant. Major finding of the study was (i) students can learn science effectively through microcomputer than through traditional method. (ii) Students' showed highly favorable opinion towards science teaching through microcomputers.

Meera (2000) studied relative effectiveness among different modes of computer-based Instruction in relation to students' personality traits. Major objective of the study was to find out significant difference among the different modes of computer-based instruction viz. tutorial, drill & practice and simulation in realizing the instructional objectiveness in biology for class XI. Quasi-experimental method as well as qualitative and quantitative approach was adopted for the study. Achievement test was used to assess effectiveness. Findings revealed that (1) different modes of computer based instruction, viz. drill, practice and simulation were more effective than conventional lecture method in realizing the instructional objectives in biology for class XI. (2) Effectiveness of the conventional lecture method and the different modes of the computer-based instruction, viz. tutorial, drill and practice and simulation were not influenced by the learner's personality.

Beder (2001) designed flexible computer-based learning package available on CD-ROM to teach students about the social and political dimensions of environmental issues. It contained resource materials that can be used by the lecturer in a large theatre, including video clips, sound recordings and overhead projection slides. The

major achievement of the study was that CD-ROM was highly successful and it was general enough to be transferable for use by other lecturers in other institutions who taught similar subject.

Khirwadkar (2001) developed computer software for learning chemistry at standard XI. Major objective was to study the effectiveness of the software package in terms of instructional time, students' (a) intelligence level, (b) motivations level, and (c) attitude towards the package and to study the attitude of the students and teachers regarding the effectiveness of the software package. Pre-test-posttest design was followed by the researcher. Tools constructed and implemented for the pilot study were the pre-test, post-test, unstructured interview schedule and structured interview schedule for chemistry teacher of standard XI. Data were analyzed with the help of ANOVA, ANCOVA, content analysis and percentages. Major findings were: (1) the software package developed was effective in terms of student's achievement and time. (2) The academic achievement in chemistry of students of experimental group was found to be affected by variables like IQ, academic motivation and attitudes. (3) Majority of experimental group students had positive attitude about various aspects of software package.

Hawkes & Romiszowski (2001) examined the reflective outcomes of Asynchronous computer-mediated communication on in-service teacher development. The computer-mediated discourse produced by the teachers was compared with the discourse produced by teachers in face-to-face meetings. Research methods including discourse analysis and archival data analysis were applied to determine the nature of the teacher discourse and its reflective content. The results shown that while the computer-mediated teacher dialogue was less interactive, it was significantly more reflective ($t=4.14$, $p=.001$) than face-to-face discourse. The study findings suggested that the value of CMC lied in its ability to facilitate professional collaboration between teachers and encourage critical reflection on educational policy and practice.

Athaide (2005) studied effectiveness of the training program conducted by Intel-training program 'Teach to the Future' for secondary school teachers. The investigator conducted ethnographic-cum-survey study. The data was analyzed using frequencies, percentage of responses, cross tabulations, binomial test, skewness and kurtosis.

Major findings of the study were large majority of the principals and teachers were found to have high level of satisfaction with respect to Intel-training for teachers.

Sankey & Nooriafshar (2005) developed multimedia version of an existing print based course. Initial responses were collected via an online response. Major findings of the study were: 1) Over 80 percent of respondents found the multimedia version of the materials less or much less time consuming to work through than the printed version. 2) The same percentage found the project management concepts presented as multimedia easier or quicker to understand than the print based version. 3) 90 percent of respondents reported that they felt the presentation of the project management concepts was either 'good' or 'very good'.

Friedman (2006) studied influence of technology course website on in-service K-12 teachers who participated in a technology integrated course. The teachers were given an online survey to determine the rate of use of their website. The results revealed that due to number of contextual barriers such as lack of access to appropriate software, a perception that parents and students could not access internet at home, and lack of time, over two-thirds of the teachers did not use their course website on a regular basis. In addition, each of the teachers surveyed found the construction of their course website to be a beneficial experience, and the vast majority intended to use it in the future.

Sun & Cheng (2007) designed e-learning instructional material for Chinese poem, presented with animation of Macromedia Flash and lean media e-learning instructional material with text. A total of four experimental groups were conducted including a number system transformation with high media richness media, a number system transformation with low media richness media with high media richness environment, and with low richness media. The test sheet for Chinese poem had 10 multiple-choice tasks and five exegesis tasks. In the ANOVA results, there existed significant effects of the fitness of the instructional content Chinese poem and media on learning score ($F_{1,115} = 36.01$, $p < 0.001$) and on learning satisfaction ($F_{1,115} = 10.36$, $p < 0.0017$). The use of high richness media in equivocal and uncertain course like Chinese poem had significant positive effect on learning score than the use of low richness media. The use of high richness media in equivocal and uncertain course like

Chinese poem had significant positive effect on learning satisfaction than the use of low richness media.

Lazarevic (2007) developed online course on andragogy of communication and media. Major objective of the study was to study the utility of the basic ICT tools for educational purpose by using LMS (Moodle) and internet resources. Study was qualitative in nature. The researcher did observation. Result stated that student successfully applied the basic ICT tools for educational purpose and gain knowledge, know-how and habits needed for virtual educational environment and efficiently use internet resources.

Moos (2010) studied self-regulated learning with hypermedia. Think-aloud and self-report data from 99 undergraduates were used to consider whether extensive use of self-regulated learning (SRL) with hypermedia results in diminishing benefits. Additionally, participants completed a pretest and posttest to measure learning outcomes. Results indicated that participants who used an intermediate or high frequency of SRL processes related to planning, monitoring, and strategies were significantly more likely to have a higher posttest score than participants who used a low frequency of these SRL processes. Results also indicated that there was no significant difference in terms of learning outcomes among those participants who used an intermediate or high frequency of these SRL processes.

Rhine & Bailey (2011) studied utilization of collaborative software and focused distraction in the classroom. Researchers explained the potential that collaborative software has for self-differentiated learning. Collaborative software documents, end-of-class surveys, and videotape of classroom instruction served as data for the qualitative research. A preponderance of pre-service teachers reported that collaborative software was useful in class. A preponderance of students reported that collaborative software was useful in class. While they indicated varying experiences with the software, an overwhelming majority reported that collaborative software made a positive impact on their learning.

Chen & Chan (2011) studied effectiveness and impacts on process prompts on students' learning and computer self-efficacy within the Technology enabled Project-based Learning (PBL) context in an undergraduate educational technology course.

Study was of survey typed and qualitative in nature. Researchers used interviews, final projects, and reflections as a tools and techniques to collect data. Percentage and frequency was used to analyze data. Results revealed that there were significant gains on students' computer self-efficacy after the completion of technology-enabled PBL. Study also revealed metacognitive thinking facilitate the construction of knowledge in technology-enabled PBL.

Farag & Shemy (2011) examined the student recall performance of the contents of online course presented via two navigational formats (linear sequential navigation version versus nonlinear free linear navigation version). The results of the study revealed that- (1) There was an interaction effect of navigation type, with the nonlinear version of navigation being better. (2) There was an interaction of cognitive style by navigation type with learners being better on the linear navigation version, while the analytics doing better on the nonlinear version. (3) The study indicated that there was an interaction of prior knowledge by navigation type, with high prior knowledge learners doing better and the difference was cleared on the linear version of navigation.

Booth & Henderson-Begg (2011) compared Flash simulation program and the second life virtual reality program, developed as a learning tool for students to practice basic laboratory procedures. A cohort of 93 bioscience students participated in the between trial. Confident gains were assessed by collecting pre-demo and post-demo scores. Results shown there was no difference in gains between the Flash and second life conditions but both had significantly higher confidence gain that the control condition. Students' scores Flash significantly higher as a learning tool in an evaluation questionnaire. The majority of students preferred to use Flash finding it easier to use, quicker and with less distractions than the second life.

Lan (2013) designed Myword tools which are specifically developed for lexical learning for the learners to use the Vocabulary Learning Strategies (VLSs) as well as e-tools provided within this system to learn L2 vocabulary for both indoor and outdoor settings during learners' free time. A two-way mixed-design analysis of covariance was conducted to determine how the vocabulary performance differed between the participants in the three groups: learning with Mywordtools with the co-sharing function (MWT-S), learning with Mywordtools without the co-sharing

function (MWT), and learning under traditional instruction (TSI). The overall results indicate that the use of co-sharing with Mywordtools not only benefited the development of VLSs by EFL students but also helped them to gain more in L2 vocabulary learning.

Fu, Chu, & Kang (2013) examined a wiki as a Computer-Supported Collaborative Learning (CSCL) environment at upper primary level in Hong Kong. Researchers used mixed-methods design, qualitative and quantitative data was collected with the help of focus group interviews, survey and wiki entries. Findings suggested that the wiki platform provided educational, technological, and social affordances for the P5 students' collaborative learning. Students' attitudes towards the pedagogical value of the wiki were found to be strongly positive after the group project implementation.

Heo & Lee (2013) studied uses of blogs and social network sites as activity systems. Data obtained from individual users of a blog (Naver) and a SNS (Cyworld) were analyzed at the individual level and extended into the social level. This study employed a qualitative research approach that was both exploratory and descriptive. In the the study data was collected through an online survey questionnaire. Overall findings of this study were that web 2.0 as an informal learning environment enabled learners to engage in different levels of interaction and participation in social activities. By increasing the level of engagement, s/he can gain more diversity in learning by relating to different dimensions of learning activities (i.e., learning as acquisition, reflection, and community-based).

Major Observations:

- In the earlier studies, researchers ensured different modes of integrating technology in teaching learning using different analysis methods, tools and techniques. Researchers used variety of tools and techniques e.g. Panel discussions, presentations by learners and teachers, submission of assignments, feedback from students, video recording, workshops, multiple choice tests, guest lectures, case study, projects, remedial teaching, disseminating instructions, easy evaluation methods, online objective testing, student-created projects, experimentations, e-merging learning, hypermedia, interactive multimedia, multimedia presentations, virtual reality community, personal information

management programs, departmental information management programs, documentation of teaching materials etc. That gives evidence of passible alternative modes of technology integration in learning.

- ❖ Researchers adopted different research design and methods like experiment design, qualitative research, survey study, mix method to carry out study. Researchers used t test, f test, ANOVA, ANCOVA, chi-square, triangulation of data, percentage, frequency to analyze the data
- ❖ Results of the study revealed that utilization of different modes in teaching learning enhance student interest, achievement, motivation. Students' have shown positive attitude toward e learning platform.

2.3 Studies related to Attitude of Student-teachers on ICT Integration

Attitude and readiness of teachers in ICT integration is very essential. Because, if they have favourable attitude towards ICT. They can effectively utilize ICT in teaching learning. The researchers have carried out different studies across globe to measure attitude of the teachers in ICT integration.

Gay (1997) studied teachers' perceptions on implementing computers in the classroom. It was a descriptive case study of five teachers' perceptions of the process of implementing technology into their teaching. The teachers' thoughts were collected through a variety of data collection methods including interviews, observations of both class periods and planning sessions, and e-mail correspondence. Major findings of the study were 1) Time and access issues were the major issues while computer integration. 2) Teachers learnt software applications and machine operating systems as they encountered tasks and glitches rather than through planned or guided instruction.

Toth (2002) studied use of computer-based interactive multimedia and motivation of the teachers from the Oneida Special School District located in Oneida, Tennessee. This study was conducted in two phases. Phase I used a questionnaire to collect data identify the factors that motivated teachers to use multimedia in the classroom. Some of the findings of the Phase I questionnaire indicated that 64% of the respondents reported using some type of edutainment software, while 47% of the respondents

reported using Internet. An analysis of the Phase II interview transcripts indicated that teachers were motivated to use and develop multimedia when they believed it was a potentially powerful tool, when they perceived it as relevant to the educational setting, and when they valued the use of multimedia resources. Beliefs, relevance, relatedness, and personal value were identified as important factors that motivated these teachers to integrate technology and multimedia within the educational setting.

Eilon & Kliachko (2004) studied school science teacher's roles in a web-based Biology course. Data was gathered from the teacher's forum and e-mail messages, students' e-mails, and interviews. The findings revealed that the teacher's role such as guidance, mediation, management, provision of technical and emotional support, in addition to the provision of information were well accepted by the students. Students encountered difficulties in implementing independent (self-directed) learning required in the web-based course, they emphasized their preference for the role of the teacher as an information provider. Learning with ICT highlighted the conflict existing between the dual roles of the student-teachers, as learners in the present and teachers in the future.

Hu (2005) studied importance of making multimedia learning packages during pre-service training and self-reported practices of multimedia design. Study was of survey research method, quantitative as well qualitative in nature. Records were studied to collect data as well questionnaire also used by the researchers. The result showed that majority of the teachers think that it was useful or somewhat useful to learn to create multimedia learning materials. Teachers teaching at lower grades (Grades 1 to 6) tend to be more positive about the experience than their counterparts teaching at higher grades, especially those teaching at grades 11-12. Regardless of the views held, majority of the respondents never created any multimedia learning packages for their students.

Kim & Bonk (2006) conducted study on the future of online teaching and learning in Higher Education. An online survey was conducted for college instructors and administrators who were members of the Multimedia Educational Resource for learning and online teaching. As per result, 47 percent student said that the quality of online courses would be superior to traditional instruction. Only 8 percent predicted that the quality of online courses would be inferior.

Zhang & Martinovic (2008) conducted a case study to study pre-service teachers' expectations and attitudes toward the learning and integrating of Information and Communication Technologies (ICT) into their teaching and learning. Study focused on effect of demographic backgrounds and social conditions of the teacher candidates, such as age, gender, English language proficiency, and previous education on ICT. Online survey and the semi-structured focus group interview questions were used for data collection. Major finding of the study was shown unexpected consistency in teacher candidates' comments despite changed circumstances.

Williams et al. (2009) studied instructors' ideas about behaviors of 21st century teachers, and explored efforts of the innovations Mini-Teach, into their course to support their pre-service teachers. Overall findings indicated that pre-service teachers used a variety of strategies to learn innovations well enough to teach or model their use to classmates; they also felt that they could use technology in their future classrooms, especially those who taught the innovation to others.

Pingle (2011) conducted a study on readiness of the higher education students studying in different streams. i.e. arts, science and commerce- both boys and the girls from degree colleges situated in Mumbai and affiliated to the University of Mumbai in terms of IT skills, collaborative learning, independent learning and reflection on learning for e-learning and their attitude towards it. Findings revealed that there was no significant difference in higher education students' (Arts, Science, Commerce) readiness for e-learning as well as their attitude towards it. A significant difference was seen in the readiness for e-learning on the basis of gender. There was a strong positive relationship between readiness for e-learning and attitude towards e-learning among higher education students.

Khan (2012) studied use of ICTs in teacher education institutions of Aligarh district of Uttar Pradesh. Major objective of the study was to study role, status, needs, and effectiveness of ICT in teacher education institutes. The study was survey type and questionnaire was used by the researchers to conduct the study. Questions contain components like online assessment, online self-learning, web-browsing, email, use of LCD/PPT package, need of ICT and its advantage, computer availability, number of computer literate, other uses of ICT as a teaching tool etc. Study had shown that proper use of ICT can spectacularly improve educational outcomes. The new

pedagogy that incorporates technology will prepare students for working in the information age. There was lack of expert and skilled teachers in the field of ICTs.

Oshinaike & Adekunmisi (2012) conducted a study on use of multimedia for teaching in Nigerian University System. Study consisted of survey research method. Structured questionnaire, personal observation and short interview were used by the researcher to collect data. Study revealed that lack of supportive infrastructures, lack of time to spend on technology, lack of/inadequate training and inadequate capital/funds on the part of the individual lecturers appear to be the major constraint factors affecting or limiting lectures use of multimedia and ICT in these faculties.

Major Observations

- ❖ Majority of Studies were of survey typed. Researchers studied attitude, potentiality, motivation level, level of application, readiness of teachers, feasibility requirement etc. Researchers adopted qualitative as well as quantitative approach. Some researchers adopted experimental design also.
- ❖ Researchers identified different attributes influencing ICT integration specifically multimedia integration:
    - Time and assess issue
    - Identify belief, relevance, relatedness and personal value
    - Necessity of innovation
    - Lack of pedagogy as per relevance
    - Lack of skilled teachers
    - Appropriate infrastructure facility
    - Teachers role as guidance, mediation, management
    - Provision of technical and emotional support

2.4 Studies related to ICT Skills

Researcher identified and categorized studies related to skill development among students, teachers, student-teachers that are presented as follow:

Krishnan (1983) studied the effectiveness of software package in terms of achievement of instructor trainees and their attitude toward multimedia package. The performance of the instructor trainees in the course test, criterion tests and in the

objective concerning comprehension, mental ability pertaining to motor skill on the criterion tests at the end of the modules and courses was studied. The scores were found significant and which means change in attitude was found to be significant. The change in attitude was in the favourable direction.

Neo & Neo (2001) accessed students' skills in framing and solving problems using multimedia technologies. The students worked in groups and each group had to pick a topic for their project, develop, design and present it in a CD-ROM. The survey consisted of questions to assess their interest in group project work and whether or not they were motivated in their project development. Results showed that the students were very positive toward the project, enjoyed teamwork, able to think critically and became active participants in their learning process. Therefore, multimedia-oriented projects, like many other problem-based learning solutions, were used alternatively as an innovative and effective tool in a problem-based learning environment for the acquisition of problem-solving skills.

Sanders (2002) studied integration of multimedia in Technology Education to improve college students' comprehension, problem-solving skills, and attitudes toward instructional effectiveness. The pre-test and Motivated Strategies for Learning Questionnaire (MSLQ) scores were used as covariates to adjust for initial differences between the groups. An analysis of covariance showed significant differences among the dependent variables for the teaching methods studied. Follow-up analysis revealed the following findings: 1) multimedia-enhanced lectures were more or less effective than traditional teaching methods with regard to student comprehension. 2) Multimedia may be an important tool for teaching performance when students had limited experience or background in materials, methods, and procedures. 3) Multimedia was not found more effective in improving student perception of instructional effectiveness.

Thomas (2008) studied and compared three instructional methods- 1) teacher-directed lecture and text-based instruction, 2) analog video instruction, and multimedia anchored instruction on the knowledge, beliefs, and skills of pre-service teachers. Participants were university professors and their pre-service student-teachers of different universities of the United States. Data was collected using multiple-choice knowledge test, a beliefs survey to assess beliefs about self-efficacy and readiness to

manage challenging behavior and collect demographic data, a performance-based skills assessment, and satisfaction surveys for both instructors and pre-service teacher participants. Major findings of the study were 1) Using two-tailed paired-sample t tests, statistically significant differences in learning was found between pre and posttest. 2) Students in the MAI, AVI, and TDI groups perceived themselves as having more self-efficacy and being more able and willing to manage challenging behavior after instruction as demonstrated by the significant findings for time between pre- and posttest. 3) Virtual lecture (AVI) was more powerful than face-to-face instruction and course readings (TDI).

Fomsi & Njoku (2011) studied undergraduate students' readiness for the use of online chat for collaborative learning. Study adopted survey method. Researcher used questionnaire on online chatting to collect data. Simple percentage and chi-square were used as a data analysis technique to analyse collected data. Study revealed that male undergraduate students' have the technology competencies needed for online chat but the female have only basic computer literacy and typing skills.

Deshmukh et al. (2012) conducted study on online science education. Objective of the study was to study understand the mindset and perceptions of the educators involved with respect to online education. Research was survey type and researcher conducted interview of the students and the data was analysed with the help of qualitative techniques of data analysis. Study suggested that the science education can help them with their ICT skills. Research also had evidence of availability of proper server facilities, need of basic ICT skills and coping up with virtual presence of facilitator and peers to follow.

Swamy (2012) tried to find out the status of ICT in teacher education institutions. A survey was conducted to identify the status on the use of ICT in educational institutions. Structured questionnaire were formulated in order to know different ICT skills and competencies. Study found that there is lacuna in internal interaction among teachers, students, or among teachers and students using email. The respondents said that they communicate with their teachers through mobile phones. On the whole, the study found that more than 90% of the students had effectively used ICT for acquisition of knowledge in their teacher education course.

Dodia (2012) assessed the ICT Based Competencies (ICTBC) needed for using ICT. Teacher educators were randomly selected from different type of colleges like PTC College, B.Ed. College and M.Ed. College. The teacher educators were given self made ICT based Competencies to rate each competency. Research suggested that needed ICT based competencies among student-teachers prior to enter in the classroom were (1) Filling up online forms, and using email. (2) Retrieving references subject related instructional software. (5) Using different ICT based material in lesson planning. (6) Making logical decision about how to present the content. (7) Creating healthy learning environment and effective planning with the support of ICT and experiences. (8) Creating trustful environment for student in which they communicate. (9) Encouraging communication between students. (10) Developing social relations by internet.

Major Observations:

- Studies revealed that ICT skills are essential for the teachers to integrate ICT in teaching learning. It is essential to cope up with present needs of the society.
- Researches revealed that multimedia could be effective tool for development of attitude of teachers. It can be effective for enhancement of ICT skills among teachers. Researches have also evidence that it develops ICT skills, problem solving skills, basic computer literacy and typing skills, comprehension, mental ability pertaining to motor skill etc.

2.5 Implications of Review of Related Studies

- After reviewing researches on use of multimedia and ICT in teaching learning process, it was found that use of ICT is well advanced and highly successful in countries like USA, UK, China, Australia, Malaysia etc. While many studies revealed lack of infrastructural facilities create obstacles for development and implementation of multimedia in teaching learning process in the context of India.
- There exists a great deal of evidence as to the different ways in which young students use technology and internet to support their learning. Review of students explored utilization of different medias particularly in form of CAI, CALM, CAiLL, and Computer Managed Instruction (CMI), Audio-video

Media, Computer Based Multimedia Leaning Package (CBMMLP), animation, e-learning approach, online learning and multimedia. Research across the globe is influenced by ICT and provide evidence of improvise integration of ICT all the way from primary level to tertiary level. While the literature review carried out here shows that research in India is somewhat limited in certain areas, particularly regarding evidence on the comparative benefits of different online teaching methods and multimedia at tertiary level. And there are few studies at teacher education level.

- ❖ the research surveyed has evidenced the impact of different modes of ICT integration like using CD-ROM, multimedia instructional system, multimedia information package, computer assisted instruction, computer based instruction, computer based interactive multimedia, multimedia animated demonstration, audio-video instructional package, e-learning, web based learning, hypermedia etc. to deliver learning material. But still, in Indian context self-learning strategies especially at higher level are very less. Strategies like integrating learning with the help of web 2.0 tools, social networking, website, webportal have evidenced of possible alternative modes of technology integration in learning.
- ❖ Researchers have adopted different research designs like experimental design, qualitative research, survey study, mix method to carry out study in the area of ICT. Researchers have used t test, F test, ANOVA, ANCOVA, chi-square, triangulation of data, percentage, frequency to analyze the data. The issue highlighted by review is that research in this area tends to be either qualitative or quantitative, rather than using a mixed methodology. There is wide scope of utilizing tools and techniques like- panel discussions, presentations by learners and teachers, submission of assignments, feedback from students, video recording, workshops, multiple choice tests, guest lectures, case study, projects, remedial teaching, training the absentees, disseminating instructions, easy evaluation methods, online objective testing, student-created projects, experimentations, documentation of teaching materials, interview, online discussion etc.
- ❖ Though different tools are used to develop multimedia package like Macromedia Flash MX, Microsoft Excel, and Microsoft Direct. More efforts are

needed to create new programs using multimedia elements and multimedia authoring tools to fulfill a content-rich learning software and courseware.

- Researches have evidenced that multimedia packages in subjects like science, mathematics, language learning were found to be effective. Results have revealed that utilization of multimedia in teaching learning enhances students' interest, achievement and motivation. Few studies have identified factors like belief, relatedness, personal values, motivational factors to be kept in mind while development and implementation of multimedia based teaching at pre-service level. Multimedia can be effectively used for enhancement of ICT skills among teachers. Researches have also evidenced that it helps in developing different skills like problem solving skills, basic computer literacy and typing skills, comprehension, mental ability pertaining to motor skill etc.