CHAPTER - II

REVIEW OF RELATED LITERATURE
CHAPTER – 2

REVIEW OF RELATED LITERATURE

2.1 INTRODUCTION

This chapter deals with the review of related studies. Review of related literature is an essential aspect of a research. The purpose of the review is to expand the contextual and background of the study, to help further in defining the research problem and also to provide an empirical basis for the subsequent development of the study. It is extremely important part of any research as it shows what other researchers have already done and what other researchers are doing contemporarily. In other words, it basically helps the investigator to find various research gap. It provides methodology, tools used for data collection and techniques applied for the analysis. Thus, it provides a critical review and appraisal of the related studies and shows how the related studies contribute towards advancing the present knowledge regarding the specific area under investigation.

Review of the related literature, an essential aspect of a research study, refers to a general retrospective survey of previous writings pertaining to one’s problem. Familiarity with the related literature develops an insight into the problem, helps the student to discover what is already known, what other's have attempted to find out and what problems remain to be solved. It guards against the possible limitations and minimizes the chance of duplication or repetitions. Thus, it is essential for a researcher to know what sources are available, what sources to use. And where and how to find them thereby saving many hours of aimless activity.

The present chapter is devoted to the review of research studies that are thought to have some bearing on the problem selected by the researcher.
2.2 Review related to ICT awareness on teachers.

Studies done Abroad

Nikilaus (1985) assessed the attitudes of Tennessee teachers toward computers in schools. The relationship of present usage of computers to affluence of school districts, school level, gender, teaching area, years of education and years of experience was also examined. The sample for the study was 586 teachers in 18 randomly selected public schools in Tennessee. The attitudes of these teachers were inferred by their responses to items on a questionnaire developed by the researcher. 350 usable questionnaires were returned. In analyzing the data the chi square test and the .05 level of probability were utilized to determine significance. Findings were: (1) Teachers viewed instructional computing to be an enduring educational innovation and felt computer experiences should be provided for all students. (2) Teachers viewed instructional computing as being motivating for students, but they were undecided concerning the effect of instructional computing on student achievement. (3) Though teachers expressed a lack of confidence in their ability to use computers in their classrooms, they indicated a high level of interest in receiving instructional computing in service training. (4) Of the variables examined in the study, present usage or non usage of computers by teachers seemed to have the greatest influence on their attitudes toward computers. (5) With regard to present usage, teachers from schools in the middle financial subgroup, at the elementary level, and with a moderate amount of teaching experience (8-15 years) were significantly most inclined to be presently using computers in their classrooms.

Davis (1988) examined the attitude of early childhood teachers towards the use of computers in their classroom. The sample consisted of 229 randomly selected teachers from five school districts. A 25 item Likert scale was designed by the investigator to assess the subjects' attitude. ANOVA and Scheffe method were used for analysis of data. Results indicated that 95.80% of childhood teachers participating in the study held a positive attitude towards the use of computers in their classroom. Although positive there were significant differences in the attitudes of early childhood
teachers towards the use of computers in their classroom in terms of certain teacher characteristics like age, ethnicity, years of teaching experience, prior instructional computer use, amount of computer training, amount of computer experience etc.

Hardiman (1988) studied the attitude of secondary school Principals towards microcomputers. 331 Principals in the state of Georgia were taken as sample. A two part microcomputer assessment survey instrument was developed for this study. ANOVA, t-test and Pearson product moment correlation were used for data analysis. It was found that the attitude of secondary school principals towards microcomputers were decidedly positive and their attitude was not influenced by variables like age, sex, degree level, school size, school system, experience etc. taken in the study.

Dupagne and Krendl (1992) reviewed the literature on teachers' attitudes toward computers; they observed that the literature generally demonstrated positive teacher attitudes toward computers. However, several studies in the authors review reported that teachers share a number of concerns about integrating computers into their instruction. Although teachers may believe in the instructional effectiveness of computers, they remain unable to make use of the technology because they have their own limitations, such as time or lack of knowledge. The primary recommendation emerging from their review of the literature was teacher training: referring to the need for schools to invest time and resources in inservice and workshop training for teachers.

Winnas and Brown (1992) tried to discern factors affecting use of the computer by teachers. A sample of 70 fourth and fifth grade elementary teachers was taken. The study found the following set of factorsthere's own attitudes toward computers and their feelings about being held accountable for teaching computers: the need for better on-site support for teachers: teachers' limited use of computer-related sources provided by the district and their lack of knowledge about the computer curriculum; limited allocations with regard to the number of computers available per school.
Rosen and Weil (1995) examined "technophobia" as an explanation for low levels of computer utilization. 171 Elementary teachers, 117 secondary science teachers, and 200 secondary humanities teachers in 54 schools across five urban school districts completed three measures of technophobia and a measure of demographic characteristics, computer experience, computer availability, and current computer use. Results indicated that: (1) many teachers were technophobic, particularly elementary teachers and secondary humanities teachers; (2) teachers were most worried about dealing with the actual computer machinery in their classroom, about computer errors, and about learning to use computers; and (3) predictive models showed that although computer experience was the most prominent predictor of technophobia, it was not the only predictor — age, gender, teaching experience, computer availability, ethnicity, and school socioeconomic status also play an important role in predicting technophobia.

Landerholm (1995) surveyed 250 kindergarten and preschool teachers in public and private schools in a five county area of Illinois, including the city of Chicago, to identify teachers' computer attitudes, knowledge and practices. The results showed that over 90% of the teachers had positive or very positive personal and professional attitudes towards using the computer. The majority of teachers had learned to use a computer through workshops, university classes or on their own. Very few teachers had received instruction at school from a school computer instructor.

Blankenship (1998) determined the extent to which the following factors predict computer use by teachers in classroom instruction: attitudes of teachers toward computers in the classroom, access by teachers and students to computers, training of teachers in computer use, support of teachers in their use of computers, age of the teacher, grade level in which the teacher teaches, curriculum area in which the teacher teaches, gender of the teacher, and number of years the teacher was from retirement. The population of the study was the classroom teachers of Carroll County (Virginia)
Public Schools. A survey instrument was designed to measure computer use and the factors related to use. The responses from the survey were analyzed with multiple regression techniques to determine which factors were predictors of computer use by teachers in classroom instruction. The nominal group technique was used to create a prioritized list of strategies to improve teacher use of computers by focusing on the factors determined to be predictors. Factors that predict computer use varied, by grade level. Training was the most common predictor followed by attitude, support, access, and age of teacher. Attitude toward computers by Carroll County teachers was favourable across all grade levels.

McCarthy (1998) focused on the attitudes of New York City teachers of special education toward the use of computers and their usefulness in educating students with disabilities. The researcher also wanted to examine if a significant relationship existed between the teachers’ attitudes toward computers and their level of involvement with computers. The researcher constructed a demographic survey sheet along with a Likert Scale-based survey instrument to gather data on the sample and their attitudes towards computers. The survey and demographic questionnaire were distributed to 150 New York City public school special education teachers. Based on the results of an item-by-item analysis of the demographic questionnaire and survey instrument combined with a statistical analysis of relevant variables, it was found that the sample had a positive attitude toward the use of computers in special education. This study also found that there was a significant relationship between the attitude towards computers and the level of involvement with computers.

Morales (1998) studied the attitudes of Ninth Graders and their Teachers toward computers and informatics. Likert scale questionnaires (Computer Attitude Questionnaire (CAQ 5.22), whereas a portion of the Survey of Teachers' Attitudes toward Computers (TAC 2.22) were administered to 78 Mexican Teachers and 590 Ninth Graders from 4 States Nuevo Leon, Guanajuato, Tlaxcal and Quintana Río. Analysis of variance indicated major differences among States, in all the variables.
measured in both samples. Electronic mail appeared to have the strongest positive attitude among students and teachers from Nuevo Leon, compared to the less positive attitudes of students and teachers from Quintana Roo. On the other hand, differences on Computer enjoyment appeared to be more evident between the States of Guanajuato and Tlaxcala. Guanajuato students and Tlaxcala teachers seemed to be the most enthusiastic about using and enjoying a computer. On the contrary, the less enthusiastic were Guanajuato teachers and Tlaxcala students. Teachers from Guanajuato seemed to be most sceptical about being a better teacher if they had a computer in the classroom, but teachers from Tlaxcala seemed to have the opposite point of view.

**Box (1999)** designed Teachers and Technology: A Snap-Shot Survey (Version 3.1) to ask teachers directly about their classroom technology related needs and beliefs. It includes demographic questions, a Liker like section on beliefs, a 5-point scale on urgency of technology needs, questions about student and instructional time using computers and a stage of technology adoptions self assessment. The survey was distributed at a meeting at the high school in a north Texas town. A total of 97 surveys were collected of which 72 (74%) were high school teachers. The sample contained 39 (40%) males and 54 (56%) females. Findings showed that while there were computers in about half the classrooms at this high school, many teachers did not plan for student use of the technology. They had sufficient motivation but did not believe that they have the tools or skills to integrate technology into the curriculum.

**Cox, et al. (1999)** carried out a study examining the factors relating to the uptake of ICT in teaching. A questionnaire was designed to collect evidence from teachers and other educators. The sample consisted of 44 male and 28 female computer-using teachers. The results showed that the teachers who were already regular users of ICT had confidence in using ICT, perceived it to be useful for their personal work and for their teaching and planned to extend their use further in the future. The factors that were found to be the most important to these teachers in their
teaching were: making the lessons more interesting, easier, more fun for them and their pupils, more diverse, more motivating for the pupils and more enjoyable. Additional more personal factors were: improving presentation of materials, allowing greater access to computers for personal use, giving more power to the teacher in the school, giving the teacher more prestige, making the teachers' administration more efficient and providing professional support through the Internet.

**Moseley and Higgins (1999)** studied the attitudes of a small sample of teachers. They found that teachers who successfully made use of ICT had a positive rather than negative attitude towards ICT. Teachers who have positive attitudes towards ICT itself will be positively disposed towards using it in the classroom. They found that teachers who successfully use technology in the classroom have positive attitudes to ICT and focus on pupil choice and individual study rather than teacher direction.

**Chifari, et al. (2000)** explored some cognitive and motivational correlates of teachers' attitudes towards the computer in school. They compared teachers' "perceived self-efficacy" (Bandura, 1986; 1997) with their approach to the computer, as an educational tool. A computer self efficacy scale, modified from an English version developed by (Eachus and Cassidy, 1997) was administered to 43 teachers from various schools. The same subjects filled in a questionnaire which was provided for exploring their computer experience. Results revealed high correlation between self-efficacy and computer experience, suggesting that self efficacy was an important cognitive correlate of positive attitude towards the computer.

**Wilson (2002)** conducted a study on the digital divide: a study of teacher awareness and efforts to address the issue. The purpose of the study was to point out the awareness level of teachers in digital divide. The research design was descriptive in nature, asking teachers to respond to the survey that sought to reveal their awareness of the digital divide. The study revealed that the teachers were the
intermediate users of Technology. And the researcher concluded that the teacher must be provided opportunities to acquire the professional development necessary to facilitate the successful integration of technology in their classrooms.

Gray and Souter (2002) conducted a study to examine the impact that the initiatives were having on ICT use in secondary schools i.e. the use of ICT in secondary subject areas, and the perceptions of teachers in these areas. From the survey, returns were received from 393 teachers. A comparison of science teachers' perceptions was made with teachers from other disciplines. Examination of the data indicated that, relative to other subject teachers, science teachers came out positively with regard to use of and confidence in ICT. However, in absolute terms although the availability of computing facilities was reportedly quite high, actual level of use was quite low. In addition, where level of use was higher, it was with regard to a rather narrow range of applications, particularly word-processing. Although there appeared to be an awareness of the potential for ICT in science, teachers indicated that they did not see the introduction of ICT radically changing the way in which teaching took place, nor changing the teacher-pupil relationship. Science teachers were reasonably confident in their use of ICT but felt that they needed much more in the way to support and professional development to maximize their use of ICT in the classroom.

Demetriadis, et al. (2003) presented observations regarding Greek secondary school teacher’s attitudes towards the introduction of ICT in the curriculum. The study showed that teachers were interested in using ICT to attain a better professional profile only to take advantage of any possible learning benefits offered by ICT but always within the context of the school culture. The authors argued that introducing ICT into schools was seen as initiating a "negotiation" process where lower level goals may be altered to preserve what were perceived as goals of higher order. Teachers' attitude to adapt ICT mode of use was supported by research evidence that emphasize the situational character of knowledge and expertise. The authors proposed that teachers' training should be combined with actions that advance school
epistemology toward a multiple context learning perspective. Such an extended action might be the establishment of extended learning communities that would help bring together out-of-school learning contexts and learning activities.

Matthiasdottir, et al. (2003) focused on the use of ICT tools by teachers, their attitudes toward the use of ICT in teaching and how it relates to their teaching. The research study was conducted in 14 Icelandic high schools and one private school. The response rate was 47% or 423 answers out of 906. The questionnaire was developed for this study in 2002 by the authors. The main findings of this study were that the use of the Internet was quite common among Icelandic high school teachers. Teachers searched the Net for materials to use in their teaching and send and receive student projects and essays. Teachers were positive toward ICT use as most of them (81%) agreed that it was preferable to use computers in teaching, but were not widely taking advantage of the range of opportunities ICT offers, such as interactive exams and web discussions. Nor were they convinced that the use of ICT in teaching will lead to better student outcomes.

Tsitouridou and Vryzas (2003) investigated the attitudes of early childhood teachers towards computers and information technology. The study examined whether or not attitudes were differentiated by a series of factors. The subjects of the survey were 107 inservice female early childhood teachers, taking part in a two-year programme of inservice training at the Department of Early Childhood Education of the Aristotle University of Thessaloniki, Greece. The results indicated that early childhood educators had limited access and positive but temperate attitudes to the world of computers. Teachers' attitudes appeared to be influenced significantly by computer use at home, experience with computers and in-service training.

Albirini (2004) investigated the attitudes of EFL teachers in Syrian High Schools toward ICT in education and to explore the relationship of teachers' attitudes with a selected set of variables. Teachers' attitudes were examined from two related
theoretical frameworks: Rogers's (1995) Diffusion of Innovations and Ajzen and Fishbein's (1980) Model of Reasoned Action. A questionnaire was developed and distributed to 326 sample teachers selected randomly from the population. The survey stage was followed by in-depth phone interviews with a purposeful sample of 15 teachers. Results from both quantitative and qualitative data indicated that the participants had positive attitudes toward ICT in education. While the participants had somewhat positive perceptions of the attributes of computers, they were relatively neutral about the cultural relevance of ICT to Syrian society and schools. The teachers also reported low levels of computer competence, access, and training. Significant positive correlations existed between teachers' attitudes toward ICT and five independent variables, including computer attributes, cultural perceptions, computer competence, computer access, and computer training. Multiple regression analysis indicated that only the first three of the above independent variables had a significant predictive value of computer attitudes toward ICT. The results indicated that 0.58% of the variance in computer attitude was explained by the independent variables included in this study.

Batane (2004) investigated how practicing teachers in one secondary school in Botswana were prepared to work with technology in their classes. Data was collected through in-depth interviewing of the principal, 15 teachers and 3 officials from the Ministry of Education. Findings indicated that teachers who had already acquired computer knowledge through their own initiative do the technology teacher training in this school. Teachers were also not satisfied with the training that they were given. It was reported in this study that when technology was first introduced in the schools, teachers who already had some knowledge about computers were the first to get involved in working with computers. It was reported that the first reaction from the teachers as the computers were being introduced in schools was that computers were for math and science subjects. The study recommended a more systematic approach to teacher training in the school so that more teachers could be involved and benefit from the training.
Coffland and Strickland (2004) sought to identify variables related to teacher use of technology in secondary level geometry classrooms in south-eastern Idaho. The primary variables examined in the study were teacher technology awareness, teacher attitude toward technology, teacher technology training, and teacher computer use for instruction. This study also tested for associations between these primary variables and principal attitude toward technology and a selected group of demographic variables: geometry teaching experience, number of sections of geometry taught, college mathematics major, and computer lab access. Four significant relationships were found. An inverse relationship was found between teacher computer use and the number of geometry sections taught. Direct relationships were found between teacher attitude and both teacher technology awareness and principal attitude. Finally, a direct relationship between type of teacher training and teacher instructional computer use was reported.

Gomleksiz (2004) explored the views of teachers regarding the use of technology in their classes. 150 English teachers were surveyed on a scale consisting of 36 items, measuring positive and negative attitudes of English teachers toward use of technology. It was determined that teachers have positive attitudes toward use of technology but they do not obtain or use technology at desired level.

Sa'ari, et al. (2005) measured teachers' attitudes and perceived competency towards information technology (IT). The sampling frame of the study consisted of secondary school in-service teachers in three selected schools, each representing the three districts in Malacca: Alor Gajah, Melaka Tengah and Jasin. A total of 160 teachers were taken as the sample of the study. The instrument used in this research was a questionnaire in the Malay language. The results revealed that most teachers possessed positive attitudes towards IT. The findings also established that most teachers had moderate levels of IT competency. They also believed that they still lack the appropriate IT skills to integrate the technology into the teaching and learning process. The results of MANOVA analysis indicated that there were significant differences between the group of competent and incompetent teachers in terms of usefulness, confidence, anxiety and aversion toward the use of IT.
Sugar, et al. (2005) applied the Theory of Planned Behaviour (TPB) (Ajzen. 1988) to assess teachers' technology attitudes. Six teachers participated in semi-structured interviews, and teachers at four schools completed a follow-up, a 45-item questionnaire. In this colloquium, they critiqued the efficacy of the TPB as a basis for assessing teachers' technology attitudes and beliefs. They concluded that The Theory of Planned Behaviour offered researchers fruitful avenues in examining teachers' decision-making processes, particularly in regard to technology use. They also encouraged researchers to use this model in assessing 51 teachers' attitude towards technology and begin to explore new applications of the model.

Kiridis, et al. (2006) elucidated the perceptions and the attitudes of Greek teachers towards the use of ICT, and explored the potential of the integration of new technologies in public primary education. The sample consisted of 951 primary school teachers from all over the country. The results revealed that although the majority of the respondents believed that ICT was a useful tool for teaching and learning, and generally agreed with its exploitation in schools, it appeared that they were not yet fully convinced about the advisability of the immediate introduction of new technologies in primary education.

Sadik, A. (2006) assessed Egyptian teachers' attitudes toward personal use and school use of computers. Data was provided by a sample of 443 teachers. It was observed that overall, teachers had high scores on the attitude scale but male teachers had more positive attitude than female teachers. Moreover, teachers who had positive attitudes toward their personal use of computers also felt positive toward the use of computers in schools. Trained teachers expressed more positive attitudes toward the importance and usefulness of school use of the computer and had higher confidence than did non trained teachers. Also, teachers who had long teaching experiences were more likely to appreciate the importance of computer use in schooling.
Samak (2006) explored factors that may influence the attitudes towards information and communication technology (ICT) by Jordanian teachers of English as a foreign language (EFL). The Diffusion of Innovations (Rogers, 1995), and the theoretical relationship between attitudes and behaviour posed by the Theory of Reasoned Action (Ajzen and Fishbein. 1980) served as a theoretical framework. A multi-sections survey in Arabic language was administered to the EFL teachers in the first and second districts of the capital city of Jordan, Amman. A random sample of 363 was utilized. The data was analyzed using both descriptive and inferential statistics. The study showed that Jordanian EFL teachers had positive attitudes towards ICT. They had a moderate computer competence and have a high access to ICT. It was also found that Age and teaching experience had a negative correlation with attitudes, whereas qualification had a positive correlation with attitudes. There was a weak positive correlation between training and attitudes. Type of training, obtaining an ICDL Certificate, and length of training were explored. Gender, teaching methods, and Grade level were found not significantly correlated with attitudes towards ICT. 64% of the total variance in Jordanian EFL teachers' attitudes towards ICT was explained by the four main independent variables of the study: attributes cultural perceptions, competence, and access.

Wozney, et al. (2006) investigated the personal and setting characteristics, teacher attitudes, and current computer technology practices among 764 elementary and secondary teachers from both private and public school sectors in Quebec. Using expectancy-value theory, the Technology Implementation Questionnaire (TIQ) was developed. In addition, teacher demographics, teachers’ current uses of technology, and availability of resources were also surveyed. The study found that: (a) expectancy of success and perceived value were the most important issues in differentiating levels of computer use among teachers; (b) personal use of computers outside of teaching activities was the most significant predictor of teacher use of technology in the classroom; and (c) teachers’ use of computer technologies was predominantly for "informative" (e.g., World Wide Web and CD-ROM) and "expressive" (e.g., word processing) purposes.
Boon et al. (2007) examined teachers' attitudes and perceptions toward the use of technology-based instruction (i.e., Inspiration 6 software) as an effective instructional strategy in inclusive social studies classes. Three high school social studies teachers, one general education and two special education teachers completed a 6-item open-ended survey on the effects of Inspiration 6 software, a computerized graphic organizing software tool. Responses indicated that teachers were positive toward the use of the software and reported the software had the potential to (a) improve student learning, (b) increase student engagement, (c) provide important study skills, and (d) improve student motivation through the novelty of using computers in social studies instruction.

Hung and Hsu (2007) analyzed the current status of computer-based technology (CBT) use in secondary schools in Taiwan. A questionnaire was developed to investigate teachers' attitudes toward computers and their application of CBT in instruction. A random sample of 100 secondary school science teachers was taken. The surveyed teachers had a very positive attitude toward computers, yet the researchers found their attitude was significantly correlated with their age and seniority. The older and more senior teachers generally held a less positive attitude toward computers. As for the application of computer-based technology in classroom instruction, most teachers claimed at least a moderate degree of implementation of CBT in the classroom. In gender difference, male teachers in general used more CBT in their instructional strategies than did female teachers. As far as age was concerned, middle-aged and more experienced teachers tended to integrate more CBT into their instruction than younger and novice teachers, even though the latter group held a more positive attitude toward computers. In correlation analysis they discovered that with male but not with female teachers, there was a direct correlation between degree of positive attitude toward computers and degree of application of CBT in classroom instruction.
Petros (2007) developed and tested the psychometric properties of a computer attitudes scale for the Greek population. A Greek Computer Attitudes Scale (GCAS) of 30 items, with three subscales: confidence, affection, and cognitive was developed. The study also explored sex differences on the GCAS, and the relationship between age, computer experience, and confidence with computers and participants' responses on the scale. Questionnaire data from four Greek samples, which included participants from the general population (185 and 354 individuals, respectively), 222 teachers and 99 undergraduate students, were analyzed. Results indicated that: (1) both the reliability (internal consistency and test-retest) and validity (concurrent) of the GCAS were adequate; (2) the relationship between age and computer attitudes was not significant, whereas sex did not have a significant effect on computer attitudes scores; and (3) perceived computer experience and confidence with computers were strongly related to favourable attitudes toward computers.

Ogunkola (2008) investigated the effect of computer attitude, ownership and use on the computer literacy of science teachers in Nigeria. 120 science teachers drawn from the four political divisions of Ogun State, Nigeria were used for the study. Two valid and reliable instruments namely Computer Attitude, Ownership and Use Scale and 55 Computer Literacy Self Assessment Scale were used to collect the needed data. Percentages, standard deviation and multiple regression statistics were employed for data analyses. The findings revealed that the science teachers had a positive attitude towards computer. Also, computer attitude, ownership and frequency of use jointly predicted the science teachers' computer literacy with the influence of computer ownership being the highest when considered individually.

Cavas, et al. (2009) investigated the Turkish primary science teachers' attitudes toward ICT in education and explored the relationship between teachers' attitudes and factors which were related to teachers' personal characteristics (gender, age, computer ownership at home, and computer experience). In order to collect data, an instrument (STATICTE) was developed by researchers and administered to 1071
science teachers almost uniformly distributed in 7 geographic regions of Turkey. In data analyses, descriptive statistics were used to describe and summarize the properties of the mass of data collected from the respondents. The results indicated that Turkish science teachers have positive attitudes toward ICT and although teachers' attitudes toward ICT did not differ regarding gender, it differed regarding age, computer ownership at home and computer experience.

Chen and Chang, proposed the whole teacher development approach as an organizing framework which was distinguished by its simultaneous focus on teacher attitudes, skills and knowledge, and practices. To test the approach, a study of teachers' technology proficiency was carried out. A total of 175 teachers from the Head Start program in the Early Childhood Department of the Chicago Public Schools participated in the study of the 175 teachers. 134 had completed a two-day session of introductory computer training. The remaining 41 teachers completed a year-long professional development program in technology based on the whole teacher approach. All teachers completed a self-evaluation questionnaire. On the questionnaire, teachers rated their competence in terms of specific indicators for attitudes, skills, and practices. Pearson correlation tests were used to determine the degree of association among measures of teacher attitudes, skills, and practices. Among teachers who participated in a technology program based on the whole teacher development approach, significant degrees of association among attitudes, skills, and practices were found. High degree of association between attitudes and skills was found which suggests that gaining confidence plays a central role in increasing technology proficiency. In statistical terms, confidence accounted for approximately half of the variability found in all teacher ratings of knowledge and skill levels. In applied terms, teachers who developed positive attitudes toward computer use were more likely to be enthusiastic about computers as learning tools, confident in their ability to learn and apply new skills, and successful in computer integration. Further, program participants reported significantly higher levels of technology skill than non participants.
Studies Done in India

Joshi (1998) carried out a survey on teacher educators’ computer awareness. The major objective of the study was to find out computer awareness level of the teachers of 31 teacher education colleges and P.G. Department of Education of different universities of Gujarat state. Findings of the study revealed that forty two percent of the secondary teacher’s education colleges has computers. Sixty eight percent of teacher educators hired the computer services and those mainly admitted that the use of computers is beneficial to them.

Amardeep and Singh (1998) conducted a study on the awareness of teachers on Educational Technology with a sample of forestry Institutions of U.P. The objective of the study was to assess the level of awareness of teachers about instructional materials, devices and methods. For data collection an interview schedule and a questionnaire were used. For data analysis mean and standard deviation and total weighted score were used. The findings of the study revealed that in case of overall awareness about instructional materials, majority of teachers were moderately aware about ET. Total Weighted awareness Score (TWS) for chalk board was found maximum (133) followed, overhead projector and transparencies (131), slides and slide projectors (118) , Posters (118), chart (117), Specimens (115) and model (112). TWS for other Materials viz. Video cassettes, audio cassettes, programmed Instructions, teletext, videotext, Computer Assisted Instructions and instructional television broadcast, varied between 50 and110, indicating comparatively low level of awareness among the teachers.

Chauhan (2002) conducted a study on the awareness of teachers in intranet/internet working at higher secondary school in Vadodara city. The objectives of the study were to know the awareness of teachers and students in intranet/internet and their use in activities like teaching learning process, homework, office work, and project work. The sample of the study was consist of six higher secondary schools of Vadodara city. To collect data questionnaire was prepared. Data analysis was done in
terms of frequencies and percentages. The findings of the study revealed that 100% teachers and students were awareness about the use for intranet/internet in the higher secondary schools with internet facilities. 20% of students and 30% of teachers were found aware about the usefulness of the intranet/internet in the school without intranet/internet facilities. The students and teachers use internet for several purposes like study, project works, to get information about results, etc.

Asan (2002) carried out a survey on computer technology awareness by elementary school teachers. To examine the perception and awareness about specific technologies, 252 teachers working in schools in Trabzon, Turkey were surveyed, with the help of a questionnaire. The main objective was to study computer technology awareness of elementary school teachers. The variable taken in the study were gender, position, teaching experience and school type. The data werecollected from the sample selected using random sampling method. Findings of the study revealed that only thirty nine percent of the respondents were found to be computer users, while sixty percent of the respondents reported that they were not computer users. Data in this study revealed that overhead projectors, printer, keyboard, modem, hard disk and video camera received the highest ranking as essential items for teaching and learning, whereas the items like, compact disc, scanner, sound card and television card were ranked lowest. In this study, significance differences were found to exist between males and females teachers in their familiarity of computer technologies.

Rathod (2002) has conducted a study on computer awareness of secondary school teachers. Main objective of the study was to study the awareness of secondary school teachers in computer. Thirty-one secondary school were randomly selected and 133 teachers of these schools were considered as sample of the study. A questionnaire was used for data collection. Data were analyzed using percentage, mean and sd. Findings of the study revealed that 11.31% of secondary teachers were aware of computer.
Kmalanayan (2008) designed a study on “Implications of Information Technology for teacher education and research”. It was pointed out that information technology in education is created the need for all teacher education faculties to be proficient in the use and integration of ICT into mainstream teacher education programme delivery.

Anil Ambasana (2009) conducted a research on “Utilization of computer technology in remedial instruction”. Results concluded that computer – assisted instruction programme in remediation task was found to be successful as the students were able to overcome the difficult points in the content. Hence they were able to increase their achievement significantly. Utilization of computer technology in remedial instruction was found effective.

Neeraj and Anitha (2010) did a study on “Computer and Internet awareness in school going students”. The study found that the required level of awareness about computer and the internet is not there. The real power of the computer is revealed in the internet. But the penetration of computer and internet is still far from desired.

2.3 Review related to ICT usage by teachers

Studies done in Abroad

Niederhauser and Stoddart (1999) carried out a survey to find out teachers instructional perspectives and use of educational software by 1093 teachers with the help of a questionnaire. The purpose of the study was to examine the relationship among teachers’ perspectives about effective instructional uses of computers and the types of software they used. The other variables of the study were grade, gender, teaching experience. The overall results indicated that the majority (85%) of the teachers participated in the study used skill based software for instruction, either solely (36%) or at least a part of the time. A large number of these teachers (49%) were in the combined group and very few teachers (15%) relied only on
constructivist-oriented software. The result of this study indicated that teacher’s perspective about effective computer based pedagogy is related to the types of software they use with their students.

**Duckett and Wanda (2001)** has conducted a study on the comparison of teachers’ perceptions of the use of computers between a school system with mandated professional development and a school system with optional professional development. The major purpose of this study was to determine what perceptions teachers had in two public school districts regarding the impact of computers upon the instructional process in their classroom, teacher level of comfort with computer use, administrative use of computers in the classroom, and frequency of use of computers in each teacher’s classroom. A quantitative survey instrument was designed for data collection. ANOVA was used to make comparisons of teacher’s perceptions regarding the use of computers in their classrooms as measured on a Likert-type scale. One of the major findings in the study was that gender played a role in the teacher’s perception regarding the impact of the use of computers upon the instructional process, teacher’s level of comfort with computer use, the administrative use of computers in the classroom and the frequency of use of computers in each teacher’s classroom. Another major finding of the study was that there were significant differences in teacher perceptions between school systems with mandatory versus optional professional development in the frequency of use of computers in their classroom.

**Batane (2002)** conducted a study to know technology use in secondary schools of Botswana. The focus of the study was on two secondary schools in Botswana that have implemented technology use in their classroom. The purpose of the study was to investigate how computers are used in the classroom and also to find out the attitude and perception of teachers, students and administration towards technology. For data collection participant observation and in depth interview were used as tools. Findings of the study indicate that computer is used as subjects with
basic skills in working with computers. Teachers of various subjects also use computers to teach different parts of their syllabi. Computers were used to retrieve, analyze and present information.

**Toth (2002)** conducted a study on teachers’ motivation and use of computer based interactive multimedia. The purposes of the study were

1. to describe the use of multimedia by teachers within a participating population of teachers, and
2. to identify factors that motivate teachers to use multimedia for instruction purposes.

The study was conducted in two phases and a questionnaire was used for data collection on the use and development of multimedia in the first phase. Interview was used to identify the factors that motivate teachers to use multimedia in the second phase. Findings of the research indicated that majority of teachers (64%) were using educational software and 47% were using internet. And all believed multimedia a powerful tool and they were ready to integrate that in educational setting.

**Tiliakos (2003)** carried out a study to understand teacher use of the internet as a new learning and teaching tool. The study explores teacher’s use of internet technologies as a tool for instruction. It analyzed the ways teacher made sense of internet technologies within the context of her/his professional beliefs and practices in the classroom. The study used qualitative methodology design and data were collected through field notes from participant observation. The result of the study provides descriptive insight into how a teacher learns to understand and use new instructional technologies such as internet.

**Erkan (2003)** examined how teachers perceive the incorporation and use of computer technology resources through investigation of teachers' attitudes. The study also examined whether and to what extent opportunities, facilities, and training
provided to teachers contribute to their acceptance and use of these resources. The data was collected through questionnaires distributed to 97 teachers. Based on the results of the questionnaires, a stratified sample of 12 teachers was selected for follow-up interviews. The questionnaire results revealed statistically significant differences between teachers who had undergone computer technology training and those who had not in terms of their attitudes toward computers and the use of computer technology resources in language teaching. Follow-up interviews were used to determine whether positive attitudes or interests led people to undergo training or the reverse. The responses supported both cases for different individuals. The results also showed that simply introducing computer technology resources does not guarantee teachers' use of these in practice. The provision of training was seen as a key factor in both changing attitudes and encouraging teachers in incorporating technology into their instruction.

Sugar, et al. (2004) examined teachers' beliefs about technology adoption as a reasoned, deliberate, intentional decision-making process, as reflected in Ajzen's (1985) Theory of Planned Behaviour. Qualitative and quantitative data were collected from teachers in four schools located in the south-eastern region of the United States. Overall results indicated that technology adoption decisions were influenced by teachers' individual attitudes towards technology adoption, which were formed from specific underlying personal beliefs about the consequences of adoption. External support from key persons and contextual resources (e.g. funding) were insignificant factors affecting teachers' technology adoption decisions.

Simonsson (2004) examined the technology use in classroom by teachers as a function of their beliefs, attitudes and perceptions. A sample of 103 Hispanic bilingual elementary school teachers along the south most borderlands of Texas and Mexico were taken. The teachers responded to items regarding their (I) beliefs about and utilization of technology when incorporating cultural components, (2) general attitudes toward technology and self-efficacy towards utilizing technology, and (3)
perceptions about their peers' utilization of technology. A stepwise multiple linear regression analysis was employed to measure teacher technology use. The total variance explained was 50.6 percent. Means, S.D. and standard errors of means statistics were presented. Results indicated that the use of technology was a function of the bilingual teacher’s beliefs, attitudes, and the extent to which their colleagues use technology in the classroom.

Mcgrail, E. (2005) examined teachers' interpretations of the relationships that they were engaged in within their frames of reference in the classroom with technology and technology-literate students. Informants included middle and high school English teachers with varying teaching and technology experiences. In-depth interviewing was selected for data collection. Results from the study revealed that teachers described their attitudes toward technology through considerations of what they seemed to gain from it, what bothered them about their own or their students' computer use, as well as what they would like to see done in their environments so that they could employ technology on a more regular basis. Teachers in this study tended to apply a critical lens when they reflected on their experiences with technology in their classrooms; some teachers were ready to question its usefulness for either their students' progress or for their own advancement. Most teachers in this study, however, did not question or reject technology altogether. Rather, they shared the multiple concerns that technology brought into their practice. From a pedagogical stance, a few teachers noticed that some students, especially young children, had conceptual difficulties when learning to use computers. The teachers in this study were willing to accept change as long as they were convinced that it would allow them to see a gain for their students as well as for their own instructional practices. Administrators, on the other hand, were reported to push for technology, for they appeared to perceive it as the ultimate goal in any educational context.
Young et al. (2012) studied on ‘Preparing instructors for quality online instruction’. They found that warned an instructor’s online role can be more difficult than one experienced in traditional classrooms. Online instructors were thought to have the extra burden of preparing courses well in advance, constantly facilitating the course, modeling good communication skills, and adjusting courses for the varied needs of students.

Reid (2013) studied on ‘Quality assurance, open and distance learning, and Australian universities’. They found that determined online instructors moved through different phases of their online learning experience, and their needs changed at each stage. Furthermore, considering educational leaders were responsible for the quality of online programs and instruction they also needed to engage in professional development, and experiment with online learning environments, infrastructures, and technologies.

Studies done in India

Solachi (1991) carried out a study on the availability and utilization of educational technology in the higher secondary schools. The major objectives of the study were to find out the various aspects of educational technology and extent to which educational technology was utilized by higher secondary schools. The sample consisted of 220 teachers taken by means of stratified random sampling techniques. And questionnaire was used for data collection. Findings of the study revealed that radio, audio tape recorder, globe, T.V. were available in the school. And these technologies were more utilized by the humanity teachers.

Gail (1999) conducted a study on predictors of teacher use of technology. This study examined the predictors of computer use by teachers on a semi rural school district. The variables examined were intended personal use of computers, intended use of computers for classroom instruction, and intended use of computers for classroom management. One hundred and forty-six teachers from elementary schools,
middle schools and high schools were surveyed, Questionnaire were used for data collection along with computer attitude scale and innovativeness scale. The results of this study indicated that younger, less experienced teachers with a higher level of educational attainment and grater self-reported computer ability are more likely to demonstrate a greater appreciation for computer usefulness and computer liking. These teachers are more intend to use. Computers for personal use; classroom instruction and innovativeness were not found to be significant predictors of teacher use of computers.

**Paramar (2002)** has conducted study on the use of Educational Technology in primary schools. The main objectives of the study were

1. to study the extent of use of Educational Technology in classroom.
2. to study the appropriateness of the use of Educational Technology in the classroom. 192 teachers were taken as the sample for the study. A questionnaire was used for data collection. Findings of the study revealed that blackboard and textbook were used maximally by the teachers, whereas CAI, camera, video cassettes player, audio cassettes player and slide projectors were difficult to found to be used by the teachers.

**Singh (2003)** conducted a study to find out the extent of usage of Information Communication Technology and related problems faced by teachers. The sample of the study comprised of eighty teachers of the M.S. University of Baroda taken purposively. Questionnaire was used to collect the data. The main objectives of the study were to study the usage of the selected information communication technologies and the related problems faced by the teachers. The variables of this study were area of study and type of users, teaching experience and interest in ICT. Findings of the study revealed that nearly sixty percent of the teachers faced problems related to self to less extent in the usage of the selected ICTs. High majority of the teachers (81.3%) used the selected ICTs to some extent only. More than half of the teachers faced problem related to institution to some extent in the usage of the selected ICTs. More than fifty percent of the teachers faced the problem related to the students to less extent in the usage of the selected ICTs.
Sikdar (2004) has conducted a study on the usage of computer and internet for educational purpose by the teachers of the M.S. University of Baroda in the year of 2003-04. Major objectives of the study were to study the usage of computer and internet by the teachers of the M.S. University of Baroda with respect to teaching purposes, research purposes and other purposes and to study the differences in the use of computer and internet by the teachers in relation to selected variables like sex, age, years of computer uses, computer accessibility, designation, teaching experience and computer training. Sample of ninety teachers were selected by purposive sampling technique. To collect data structured questionnaire was used. To analyze the data SD, ‘t’ – value and ‘F’ value was found out. Findings of the study revealed that more number of the respondents was using computer and internet for most of the times for research purposes. Whereas, majority of the respondents were using it for teaching purpose and for other purposes. They used computer and internet to less extent. Computer and internet usage for educational purpose did not differed significantly in relation to sex, age, designation whereas it was found significantly different in relation to the variables like, years of computers uses, computer accessibility, teaching experience and computer training.

M. Gupta, and V. K. Gupta (2014) In his paper “Role of ICT in school education for teaching and learning” Education is not just teaching students based on prescribed syllabus in the four walls of a classroom. It has much border objectives, goals as well as other concepts. Hence, Classrooms without borders needs to be the concept of the contemporary education system. ICT is an answer to this concept. It helps to deliver education anytime and from anywhere.

2.4 Review related to status of teaching of science

Teaching of science provides plenty of opportunities for integrating ICT. There are various types of software, simulations, and additional hardware that make it possible to easily integrate the computer within the classroom. The Internet provides a huge resource for teaching strategies, ideas and lesson plans. Each different subject
area has unique opportunities for ICT. It is the responsibility of the professor and the teacher to keep current in their professional teaching and with the technology. Science has been visualized as a great human enterprise.

**Studies done in Abroad**

Gagne (1965) and Carin and Sund (1970) described the structure of science in terms of its intellectual effect, such as body of knowledge, process of acquiring knowledge, a set of attitudes, a way of systematized thinking etc; apart from its materialistic effect of producing good food, clothing, housing, medicines and other human luxury and life. Hence science finds an important place in ever growing school curriculum. Accordingly, the teaching of science has been an ever challenging profession for science teachers particularly since last fifty years, when science education came to be recognized around the world as an independent field of research. While reviewing the research studies related to science education that were taken up during the last few decades, it was realized that these studies never focused on any single theme but fully scattered over. Moreover, the studies pointed out more defects than effects. Some survey studies pointed out to the problem of laboratory facilities, insufficient teacher training, weak curriculum and poor course structures.

Anderson (1987) summarized the results of an international level study of classrooms conducted in nine countries. He found that three primary type of activities occurred to a greater or lesser extent in the classrooms in all participating countries: (1) teachers talk “at” or “with” their students, (2) students work on assignments at the desks or at laboratory tables, (3) and teachers engage in a set of general classroom management activities such as taking attendance or distributing and collecting papers etc. Peter, Akin Sola, Okebukola, Johson and Johson (as cited in Anderson, 1987) proved that co-operative and competitive learning techniques exert note-worthy effects on a variety of cognitive and social effective variable. Cooperative-competitive learning techniques have greater positive effects on student’s performance in science when compared with traditional approaches. Hankoos and
Penik (as cited in Anderson, 1987) reported that the discovery classroom climate facilitated better gains in student’s knowledge of nature of science and science related attitudes. So, to be brief, in India, aims, curriculum, textbooks, techniques, laboratory facilities, audio visual aids were all subject to criticism.

Olteanu, Dumitrescu, Gorghiu and Gorghu. (2007) studied on “People perception concerning the implementation of ICT in the classroom”. Results found that easier understanding of the content due to the using of ICT, and increasing the fastness and attractiveness of the teaching modalities which combine the ICT with traditional methods. Some teachers found it was also good opportunity to discuss with another teacher on how they can improve their teaching methods. They pointed that the use of ICT in the teaching process of mathematics, computer science, physics, chemistry, history leads to an important increasing of pupil motivation.

Studies done in India

Veerappa (1958), in his comprehensive study on status and trends in science education covering from primary to university level, pointed out that due to want of laboratory facilities and due to the lack of well trained science teachers, science education in India was not on proper footing.

Brown (1966), in his study on the list of objectives of science teaching in India, expressed satisfaction that the objectives revealed a concern of science educators for developing an adequate understanding of processes of science in students.

But no further development in this line during the subsequent years was identified by Dorasami (1970), Bhatnagar (1970), Pritham Singh (1971) (as cited in Buch,1979), who pointed out the weakness of teaching science due to lack of process oriented conceptual goals among the objectives fixed for science of teaching.
Patole (1967) also pinpointed to the lack of science apparatus, science rooms and qualified teachers as the existing weaknesses in teaching of science in rural primary schools of Kolhapur district.

Swarnamma (1978), in a state wide survey, observed that the achievement level of seventh standard pupils in biology was not quite satisfactory because teachers did not gain adequate mastery even in case of simple skills and experimentation. Also, it was found that the teachers, in general, failed to develop scientific attitude among pupils.

Gupta (1978), in his report on science teaching programme in Hoshangabad district, remarked that the state of science teaching in our country had been highly unsatisfactory.

Rajput, Guptha and Vaidya (1978) conducted two studies: (i) In a survey on opinion of science teachers with respect to the objectives of laboratory work, the following objectives were outlined: to verify facts taught in theory classes; to create interest in science; to prepare good scientists for the country, to develop skill of handling apparatus/equipment; to observe and critically think about the results; to develop the habit of reasoning, to avoid memorizing the subject, and so on. More interesting is to note that although these lofty objectives were perceived by the science teachers, the major unwritten goal of laboratory work was, however, to prepare students for practical examinations held externally. (ii) In a survey conducted in the western region of India on status of laboratory facilities available in the secondary schools, some of the problems faced by teachers were listed: like lack of free time for practical work, poor quality of apparatus, lack of necessary skill to conduct the experiment, poor human and physical resources etc.
Krishnan (1981), in a critical study of the secondary school science curriculum of the states of Kerala and Tamil Nadu, found that the curriculum of Kerala was lacking teacher’s handbook and was weak in providing experiences for developing general manipulative skills. The curriculum of Tamil Nadu was found weak in laboratory work, audio visual aids and in provision of textbooks. Siddique (as cited in NCERT, 1991), after summarizing various curriculum programmes commented that in India, science teaching had yet to take a new impetus and in classrooms one could find that science was either reading or telling and in very few cases science was doing. Sharma (1984), in his study, surveyed growth and development of science education in Bihar and found that there was a need for modernizing and strengthening administration in the field of science education, especially with respect to aims, curriculum, text book, techniques, materials and equipments. Some of the studies also pointed out the domination of lecture method in science classrooms. Maddu (1978) found that most of the biology teachers preferred lecture demonstration method. Ragini (as cited in NCERT, 1991) studied the classroom behaviour of science teachers by using science teaching observation schedule (STOS) developed by Eggleston, which revealed that teacher were intended to impart more information, ask questions and direct the students for fact finding rather than to involve students in science activities. Hence the teachers were more didactic and not heuristic in their classroom behaviours. Lack of stress on science process were of concern in few studies.

Vardhini (1983) conducted an experiment to test the developed multimedia verses instructional strategy for teaching science at secondary level. The experiment was conducted for an academic year to cover 19 units of the subjects chosen for study. Results revealed that (i) almost all the units indicated average and high level of performance of the total test. (ii) The strategy was found valid against the criterion of scientific attitude in that significantly higher performance was noted for the group in the post test over the pre test. (iii) Validity of the strategy was established from reactions expressed by students for its continuance and also their improvement in
science achievement. (iv) Programmed material and discussion sequence were equally effective on the total test. (v) The strategy was found feasible when seen in terms of its reproducibility and the cost management by individual's schools.

**Desai (1985)** investigated into efficacy of different instructional media in the teaching of science to the pupils of class 8th in relation to certain variables. The major findings of the study were (i) the programmed learning approach was more effective than the traditional way of teaching science. (ii) The experimental approach was more effective than the traditional way of teaching science. (iii) The use of instructional media indicated the possibility of improvement in the methodology of science teaching, raising the standard of science education in secondary schools and development of taste and interest in the younger generation for the subject of science.

**Gangoli and Vashista (1991)**, in their report on trend on research in science education in India suggested that science education research, thus, should direct its attention, (i) in improving the existing procedures of science instruction, (ii) in establishing new and verified procedures for teaching science and (iii) to emphasize that science education should result in the development of abilities and dispositions of mind rather than merely the transfer of dead subject matter. It is a right comment by Bose et al. (as cited in Gangoli & Vashista, 1991), who in their study-report on position of science education in India, assessed that the state of research in science education in our country had not been encouraging. It had almost remained restricted to the areas of instructional materials, methodology of teaching, resources and facilities available in schools for teaching science. Amidst all these situations, the important aspect of educational developments in India during the past few decades, since independence had been the continuous and sustained effort to evolve a national system of education and to keep revising it to the contemporary educational and social demands, for which the National curriculum framework (NCF) were evolved. These literatures provide an opportunity to see the trends in curricular revision of science. Some relevant implications were drawn below from such literatures which help to
build up theoretical formulation for the present study. “The curriculum for the ten year school” (NCERT, 1975), in which the importance of science education was projected as per the recommendation of National Policy on Education (NPE) 1986, resulted in mismatch between curricular objectives and actual transaction of curriculum in the classroom.

Kumar V.S. (1992) revealed that development of scientific attitudes depend on one’s perception of science teaching and nature of learning experience. So, suitable classroom setting and nature of learning experience are emphasized for developing of nature of science and science related attitudes among students. But at the same time, studies outside India showed more concern on student centered classroom and learning techniques.

Meera (2000) designed a Quasi-experimental method as well as qualitative and quantitative approach to examine the study on “Relative effectiveness among different modes of Computer-based Instruction in relation to students” personality traits. The sample was taken four groups of each having 35 students selected through probability sampling method. It was observed from the results that: (1) 78 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 at 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 learners’ personality. (3) There was significant difference among the different modes of CBI (Computer based Instruction), viz. Tutorial, Drill and Practice and Simulation in terms of their effectiveness in enhancing the retention of cognition as revealed by the learners’ performance in the retention test. There was significant difference among the different modes of Computer-based Instruction in enhancing retention of what have already learnt. Seventy five references were included in the study.
Subbaiah (2005) did a research on Application of ICT in English Language Teacher Education. A method with normative survey technique and experimental were used. The sample was taken 29 District Institutes of Education and Training from Tamil Nadu, 71 English teacher, educators and 200 teacher trainees by using (1) Questionnaire, (2) Attitude scale, (3) Interviews, (4) Diary analysis used for data collection. The results were found that (1) Sixty-six per cent of teacher educators do not know the basic principles of computer. (2) It is unfortunate that the ICT practices have not seen the widespread application for teacher education. (3) Attitude of teacher educators towards ICT is quite positive. (4) It reveals that the focus of computer equipment problem had both quantity problem (not enough computers) as well as quality problem. Seventy-two references were cited in the study.

Chenna Reddy (2006) conducted study to assess the “Information Technology to face the challenges in today’s education”. The results obtained that computers are revolutionizing all fields of activity today with the need for data ware housing, data analysis, decision making and presentation becoming an important aspect of modern living, the author states that the transformation in higher education needs to utilize the tools of information technology that have become available.

Singaravelu and Muthukrishna, (2007) focused on the learning activities to be performed in the traditional learning by exploiting the modern ICT and dwells on the feasible learning activities in the domain of ICT in order to better and further the e-communication learning outcomes of the students in education in general and higher education in particular. This study concluded that Information and Communication Technology is uniquely placed to generate the quality in higher education. The full benefit of technology in the educational process is realized only by enhancing the technology skill of faculty and students, ensuring adequate system support and providing the funds necessary to build a new academic framework around the new resource. Available resources can be utilized and implemented in the research work to
promote the teamwork, global consciousness, self paced learning, self learning, problem solving and cognitive process.

**Arora (2007)** carried a study on The ICT laboratory: Analysis of computers in public high schools in rural India, Journal and Association for the Advancement of Computing in Education. Results found that most of the high schools were created within the last few years in Kuppam. They were surprisingly not only functional but also managed to keep attendance rates high and dropout rates low. Also, having met some excellent and dedicated teachers within the public school system, it was apparent that leadership within this sector was a real possibility. Nor can we consider the ICT efforts completely wasted on these schools; there was a sense of pride created and interest generated among the teachers and students for gaining these privileges. Overall, at least in Kuppam, transformation was not just a concept or a subtle layer but a tangible reality. However, to sustain this, continued support is needed from the public and private sector.

**Geoff Walsham (2010)** examined on ICTs for the broader development of India. Results revealed that many ICT-based initiatives have taken place over the last decade and some positive effects have resulted. However, the beneficiaries are almost always not the poorest or most disadvantaged groups, it is hard to scale up initiatives to have effects throughout India, and the need for attitudinal and institutional change remains a fundamental problem. It is argued that ICTs should not be seen as „silver bullets for development but neither are they irrelevant. Rather, they are potentially important contributors towards development in India but only through their integration in wider socio-technical interventions.
2.5 Studies related to learner’s computer self-efficiency.

Studies Done in Abroad

Compeau and Higgins (1995) discussed the role of individuals' beliefs about their abilities to competently use computers (computer self-efficacy) in the determination of computer use. A survey of Canadian managers and professionals was conducted to develop and validate a measure of computer self-efficacy and to assess both its impacts and antecedents. Computer self-efficacy was found to exert a significant influence on individuals' expectations of the outcomes of using computers, their emotional reactions to computers (affect and anxiety), as well as their actual computer use. An individual's self-efficacy and outcome expectations were found to be positively influenced by the encouragement of others in their work group, as well as others' use of computers. Thus, self-efficacy represents an important individual trait, which moderates organizational influences (such as encouragement and support) on an individual's decision to use computers.

In a study conducted to provide evidence of factor scale validity and reliability for an instrument that measures constructs to demonstrate motivation to use technology in learning and future teaching among pre-service teachers Lynch and Lora (2002) attempted to uncover structural relationships, using Structural Equation Modelling analysis between gender, prior technology experience, and opportunities to integrate technology in a project-based environment, with the dependent variable technology skill self-efficacy. The results of this study revealed factor scale validity and reliability using the instrument. The structural model revealed relationships between gender, technology value-beliefs and skill self-efficacy. More specifically gender analysis revealed that females had higher value-beliefs for technology and less technology skill self-efficacy than males. Males were found to have higher technology skill self-efficacy and lower value-beliefs. Other important structural relationships found revealed that an opportunity to integrate technology in project-based learning situation was a predictor of technology skill self-efficacy. Finally there was a predictive relationship discovered for technology skill self-efficacy with prior experience using technology in a problem-based environment.
Ross, Hogaboam-Gray, (2001), examined the effects of a change in teacher efficacy when students moved to a new grade with 387 students aged 6-9. The effects of 4 dimensions of computer teacher efficacy on 3 types of student benefits (improved basic and advanced computer skills and increased computer self-efficacy) were investigated. Students in an upward trajectory (i.e., those who moved from a teacher with low computer confidence to a teacher with high confidence) benefited more from an infusion of technology than students in a downward trajectory (i.e., those who moved from a high- to 58 alow- confidence teacher). Teacher efficacy variables explained 7%-9% of the student outcome variance. The effect of teacher efficacy on student outcomes was stronger when district in-service training was differentiated for individuals, distributed throughout the implementation period, established in-school networks, and was complemented by support focused on instructional rather than hardware issues.

Jun (2002) applied the methodological framework of the Internal Referencing Strategy (IRS) as well as Kirkpatrick's levels of training analysis and Malcolm Knowles theory on andragogy to determine knowledge acquisition between two different types of learning modes; e-learning and the classroom (E-learning: An evaluation of knowledge acquisition in training). Three hypotheses were developed to explore how well participants learned in the classroom or online environment. A paper and pencil 35-item, multiple choice 37 pre- and post-test were administered to Human Resources professionals throughout the United States. These participants were enrolled in the online or classroom courses of the "Human Resources Learning Systems" (an HR certification course containing 6 different learning modules) through various Universities. In summary, differences were found between the two learner groups in their pre-treatment knowledge. Post-tests revealed that e-learners learned just as much as the classroom learners. Additionally, there were no significant differences in training satisfaction between the two groups.
Croxall (2002) took up a study in which teacher educators' perceived computer skill and comfort levels, and importance placed by teacher educators on technology in secondary and college methods courses were investigated. The survey was sent to 208 teacher educators nationwide and information was obtained from 86 respondents. FACS teacher educators reported average computer skills and expressed confidence in their ability to teach and demonstrate technology in the classroom.

Burkett (2002) reported on changes in self-efficacy (SE) following participation in online discussion boards and electronic journals during an undergraduate course related to educational technology. A self-reported computer skills survey was used for stratified random assignment of students to one of four groups: directed web-based discussion, undirected web-based discussion, directed electronic journal writing and undirected electronic journal writing. The study was conducted as a two-phase, dominant/less dominant design. The Computer Attitude (CA) and Self-Efficacy Survey were completed during the first class, midterm class, and final class. Data were analyzed using repeated measures ANOVA. Low enrolment and attrition limited analysis to only female participants. Averaging across groups, the students (n=96) experienced 56 statistically significant increase in CA. There was no main effect for either CA or SE and no interaction between the groups and time for either CA or SE.

Maninger (2003) undertook a study to demonstrate the effect of computer technology integration techniques on pre-service teachers' feeling of computer self-efficacy. And also the purpose of this study was to interpret these pre-service teachers confidence in using computer technology integration techniques in lesson planning and instruction during student teaching. The participants of the study were from two intact, non-randomly-formed classroom; they were 27 pre-service teachers enrolled in the College of Education at a north central Texas in two sections of a course entitled EDEE 4350 for mathematics in the Elementary School. The study employed following instruments: the Demographic Data and Previous Context Use of the
Computer Scale which described participants' demographics and their previous usage of computer; the Self-Efficacy With Computer Technologies Scale; the pre-service Teacher Software Integration Confidence Scale; and the Lesson Plan Infusion/Integration Scale. The results of the data analysis revealed that there was no statistically significant difference treatment groups (p<.05). The post-test-only Pre-service Teachers Software Integration Confidence Scale revealed a statistically significant difference between treatment groups (p<.05). The post-test-only Lesson Plan Technology Infusion/Integration Scale revealed no statistical significance between treatment groups (p<.05). A study aiming at evaluating computer self-efficacy of 151 Thai undergraduate students was conducted by Noiwan, Piyawat and Norcio (2005). The computer self-efficacy questionnaire by Kinzie, and Powers was utilized to gather the data. Generally, the survey results address that students possess neutral confidence in using computer applications. Moreover, a number of significant relationships among computer attitude and computer self-efficacy subscales are discovered.

Van and Stacy (2003) in their study titled “A computer training intervention on school counsellors self-efficacy, skills, knowledge, and attitudes” evaluated a computer training intervention for school counsellors for its effects on computer self-efficacy. The intervention was delivered to 72 school counsellors working in public schools in Orland, Florida. The training workshop served as the treatment intervention to teach counsellors how to implement computer skills, such as using electronic mail, searching the Internet, developing Power Point presentations, and creating Web page designs. Further, this intervention attempted to improve self-efficacy of school counsellors. Hypotheses were tested based on data derived from a pre-test - post-test control group design. Subjects participated in one of two experimental groups. One (E1) was a treatment group and participants took part in a one-day workshop and the second (E2) served as the control group. Results indicated that the school counselling training intervention showed significant differences in computer self-efficacy. Adebowale, Adediwura & Bada, (2009) found no influence of gender on computer
self-efficacy. Computer self-efficacy was found to be improving as a result of participating in the online forum (Burkett, 2002), by a computer training intervention (Van & Stacy, 2003), by computer technology integration techniques (Maninger, 2003) and a computer course (Abbitt and Klett, 2007). Neutral computer self-efficacy among undergraduates was reported by Noiwan, Piyawat and Norcio (2005). Significant relationships among computer attitude and computer self-efficacy subscales were also discovered (Noiwan, Piyawat & Norcio, 2005). Relationship between computer self-efficacy and individual expectations of outcome of using computers, emotional reaction to computer and actual computer use was found by Compeau and Higgins (1995). Relationship of technology self-efficacy with gender, prior technology experience, opportunity to integrate technology was established (Lynch and Lora, 2002). Abbitt and Klett (2007) found that perceived comfort with computer technology was found to be a significant predictor of self-efficacy beliefs towards technology integration. Significant relationship between teachers self-efficacy on students self-efficacy were reported (Ross, Hogaboam-Gray, 2001). Only one study was found which considered the computer self-efficacy of student teachers, indicating the need for exploring student teachers computer self-efficacy and its relationship with other related variables. Impact of teacher educators computer competency and institutional factors are not explored.

Van and Stacy (2003) in their study titled “A computer training intervention on school counsellor’s self-efficacy, skills, knowledge, and attitudes” evaluated a computer training intervention for school counsellors for its effects on computer knowledge. The intervention was delivered to 72 school counsellors working in public schools in Orland, Florida. Results indicated that the school counselling training intervention showed significant differences in computer knowledge.

Wu (2003) explored Freshman English teachers' and learners' beliefs toward computer use in language instruction. Two self-report questionnaires, a Teacher Survey and a Student Questionnaire, were administered to 13 Freshman English
teachers and 180 students, respectively, in Changhua and Yunlin Counties in Central Taiwan. The data were analyzed by percentages. The results showed that the majority of teachers and students had minimum computer knowledge. Word processing, e-mail, and surfing the Internet were used most often by the participants. Regarding multimedia equipment and 40 services on campus, most teachers were not aware of them. Responses from three teachers (23.1%) indicated that they integrated computers into language instruction because they would like to make instruction more interesting, improve their teaching, and provide students chances to write more as well as use popular technology. They asked students to search for materials on the Internet, to submit assignments on line, and to communicate with others. Teachers and their students thought the computer facilitated language teaching and learning as well as motivated students to learn a language. Both computer-use and non-computer-use teachers shared some beliefs toward computer use. They felt that the computer improved the quality of language instruction; however, their role would not be enhanced, but degraded. Nine out of thirteen teachers expected to integrate the computer into language instruction; however, four did not because of lack of technical support. The majority of students hoped that the computer could be incorporated into language instruction more than it was; nevertheless, they did not think the teacher could be replaced by the technology. The majority of teacher and student participants thought the teacher could be a guide mentor or a language advisor, whereas the computer could serve as a facilitator or a supplement to instruction. To summaries, it is observed that there is no concurrency in the results of the effect of computer course on computer knowledge of the trainees. Only a few studies report that the introduction to computer course have improved computer knowledge of the trainees (Webster, 2005; Lindauer, 2004; Van and Stacy, 2003; Patil, 2006) but a study revealed no significant difference in the post test scores of experimental and control groups (Jun, 2002). Further, factors influencing student teachers computer knowledge are not explored.
Marvin (2004) in a study titled “Pre-service teachers' perceptions and performance-based abilities with technology-integration-related computer skills” intended to develop, through the exploration of empirical data, an understanding of the technology-integration-related computer skills of pre-service teachers. In contrast to most prior research that has investigated this topic with self-reported assessment techniques, this study aimed to use performance-based assessment techniques to obtain actual data produced by the pre-service teachers. To compare the findings of the two test types, this study gathered both the self-reported perceptions and the actual performance-based abilities of the same technology tasks. In addition to determining the extent to which pre-service teachers could actually perform relevant computer tasks, this study was conducted to determine if a statistically significant difference existed between the perception and performance of the pre-service teachers on spreadsheet, presentation, and Internet tasks. Likewise, it sought to determine if any statistically significant differences between perception and performance were related to gender, age, and ethnicity, grade level of certification, degree goal, or years of teaching experience. Through the use of researcher-created instruments, the Computer Skills Survey (CSS) and the Performance Assessment Rubric (PAR), this study identified how pre-service teachers (n=64) at the University of Memphis perceived and actually performed computer-related tasks. Statistically significant differences between how the pre-service teachers perceived (i.e., self-report) and performed with spreadsheets, presentations, and the Internet were found. In all cases, the 43 pre-service teacher overestimated their actual abilities with the related applications. The t-tests further identified the specific tasks within each of these computer-related categories as items in which perceptions were statistically higher than their performances. To summarise the review of this section, it was observed that the studies considering student teachers’ computer skills as a variable are very few. The studies undertaken have tried to see the relationship between self-assessment and performance assessment of the computer skill which showed that self-assessment will be an over-estimation of the actual skills (Marvin, 2004).
A study was also taken up to compare the perception of faculty and pre-service student technology skills (Best, 2002). Teacher educator’s computer skills were explored in one study (Croxall, 2002). Al-Hassan (2004) studies influence of achievement goals, self-monitoring, interest in subject matter and goal orientation on computer skill achievement. Need for modelling of technology integration was sought (Best, 2002). But teacher educators reported average computer skills (Croxall, 2002). No studies were reported which explored the influence of teacher educators computer skills on student teachers computer skills. Influence of institutional factors on student teachers computer skills was also not explored.

**Al-Hassan (2004)** conducted a study with the purpose of examining the effects of two self-regulated learning strategies, assigning achievement goals to students (process or outcome) and self-monitoring of learning, on students' computer self-efficacy. Moreover, the study sought to identify the effect of students' initial goal orientations and interest in learning on their self-efficacy. Participants in this study were 96 college students enrolled in four sections of an introductory course in educational technology. Students' ages ranged between 18 and 20, and majority of the students were females. Students' initial goal orientations, self-efficacy beliefs, their use of learning strategies, and interest in the subject matter were examined using the relevant sub-scales from the Motivated Strategies for Learning Questionnaire (MSLQ). Students' interest had a positive effect on students' computer self-efficacy. In a study “Using electronic bulletin boards and journals to enhance pre-service teachers” self-efficacy and attitudes toward the use of computers”

**Lindauer (2004)** conducted a study in which faculty perceptions of the current status of pre-service physical education teachers' competencies in instructional technology at NCATE and non-NCATE institutions was studied. A researcher designed on-line questionnaire was used to measure PETE faculty perceptions. Respondents (N=106) were represented from accreditations, Carnegie classifications, and AAHPERD districts. MANOVA was used as the statistical technique to compare
NCATE accredited and non-NCATE institutions on the questionnaire factors. Statistically significant differences were found between groups in technology knowledge, and technology integration in student learning activities. Patil (2006) developed a Multimedia Instructional System on Computer Education for B.Ed. Pupil Teachers and studied its effectiveness on student teachers’ achievement in computer education. After ascertaining the needs in the context of the Computer Education, the Multimedia Instructional System was well designed and developed. Authoring software Macromedia Director 7 seems to be quite compatible for the purpose. Alpha testing was done to further develop the system through the expertise available. The pilot testing of the prototype was done through two group pre-test post-test design. Final implementation of the Multimedia Instructional System was done on a sample of 64 pupil-teachers. Significant difference was found between the performance of the pupil teachers of control group and experimental group on post-test. In his study “The effects of different scaffolding strategies, prior knowledge, computer attitudes, and expertise reversal effect on learning outcomes in a cognitive apprenticeship learning environment” Schwarz (2003) aimed at examining the effectiveness of two scaffolds, specifically the 38 availability of optional coaching and mandatory extra material within a cognitive apprenticeship framed learning environment that taught techniques for conducting online research. In addition, the study examined the viability of incorporating learning strategies and methods inherent to cognitive apprenticeship (modelling, coaching, fading, articulation, reflection, and exploration) in an online learning environment that taught techniques for conducting online research. Issues pertaining to the viability of the cognitive apprenticeship methods were examined while controlling for both learner attitude toward computers and prior experience in research techniques. Further, the study sought to examine to what extent, if any, expertise reversal was evident in learner outcomes, and its effect on group and inter-group performance results. For purposes of this study, Expertise Reversal Effect has been defined as a phenomenon in which participants who have demonstrated "expert" levels of prior domain knowledge on a baseline pre-test exam then perform below, and frequently significantly below, that baseline score on a post-treatment knowledge
post-test for that same domain. The results indicated that there were no statistically significant effects on the post-treatment knowledge of research techniques post-test across the four scaffold groups. In addition, the data indicated that there were statistically significant main effects of the prior knowledge of research techniques covariate on the post-treatment knowledge of research techniques post-test, as measured by an expert-validated prior knowledge of research techniques pre-test. Further, when the data for the participants who demonstrated expertise reversal was separated from the primary data corpus and the two subsequent data-groups were re-analyzed separately, both data groups indicated a statistically significant main effect on the post-treatment knowledge of research techniques post-test dependent measure when the four scaffold groups were the independent variable and when controlling for pre-treatment prior knowledge, as measured by an expert-validated pre-test of research techniques.

A quasi-experimental study by Webster (2005) investigated the impact of completion of introduction to computers course on postsecondary students' confidence in computer use and basic computer literacy. The study also examined whether there was a relationship between computer use confidence and computer literacy scores prior to taking the introduction to computers course and certain student characteristics, if the gain in computer use confidence ratings of computer literacy scores at the end of the introduction to computers course was different for comparable students not enrolled in the course, and the relationships between student computer use confidence and student computer literacy scores. The following conclusions were drawn from this study: (a) The number of prior computer classes taken and hours spent using the computer for educational purposes have a positive relationship to pre-test computer literacy scores. The number of prior computer classes taken, hours spent using the computer for educational purposes, and hours spent using the computers for e-mail have a positive relationship to pre-test computer use confidence scores, (b) Completion of an introduction to computers course results in significant increase in computer use confidence ratings, (c) Completion of an introduction to computers
course results in a significant increase in computer literacy scores, (d) Students completing an introduction to computer course have higher gains in both computer use confidence ratings and computer literacy than students not completing an introduction to computers course, (e) There is a positive relationship between computer use confidence ratings and computer literacy scores. Students with higher computer literacy scores will also have higher computer use confidence ratings.

Wong and Alan (2007) conducted a study among Malaysian student teachers to assess the “Gender differences in attitude towards information technology”. Results were found that gender does not have an impact on the attitudes of female nor male student teachers towards information technology when the same amount of exposure is given to both groups. There was also a significant difference in the aversion and usefulness dimensions for both genders at the end of course, an indication that the course played a role towards improving the attitudinal measurement in these two dimensions.

Abbitt and Klett (2007) investigated the influences on self-efficacy beliefs toward technology integration among pre-service teachers at two mid-sized public institutions in the Midwest region of the United States. Using pre & post measurements of perceived comfort with using computer technology, perceived usefulness of computer technology, and ratings of self-efficacy beliefs toward technology integration, this study identified possible influences on self-efficacy beliefs. Specifically, this study found that Perceived comfort with computer technology was found to be a significant predictor of self-efficacy beliefs towards technology integration, while perceived usefulness was not found to have a significant predictive relationship. This study also found that all of the groups demonstrated a significant increase in self-efficacy beliefs while enrolled in a course focusing on technology integration even though the courses varied in course design and weekly instructional time.
**Philip (2008)** examined on ICT attitudinal characteristics and use level of Nigerian teachers. Results revealed that ICT use level of teachers was significantly related with each and the combination of attitude constructs. The findings also revealed that perceived control factor, behavioral factors and defense factors contributed mostly to the prediction of ICT use level of teachers. A major finding of the study is that ICT use level and each of the attitudinal constructs are significantly related. Particularly, the study determined that behavioral factor and perceived control factor have the strongest relationship. The usefulness of technology is now universally acknowledged, thus perceived usefulness does not discriminate among today’s technology users. The reason why perceived ease of use does not predict use level among teachers is not immediately apparent.

**Studies Done In India**

**Anjali (1999)** examined to know the developing computer software for learning chemistry at standard IX. This study found that the developed software package was found to be effective in terms of academic achievement of the students. The students and teachers were found to have favorable opinion towards the software package. There was found an interaction effect of IQ, motivation and opinion of students on their academic achievement.

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

**Regina, Grozman and Ticzon (2004)** conducted a survey on teachers to determine the incidence of technophobia and the attitude of teachers towards online
learning and teaching technologies. The study revealed that public school teachers are generally more afraid of computers than their peers working in private schools. Older teachers were more afraid of technology than younger ones. But, on the whole teachers had positive attitude towards online teaching and learning technologies.

**Nagappa and Shahapur (2005)** examined the “Study of attitude of secondary school students towards computer assisted learning. Boys of aided schools have a more favorable attitude towards CAL than boys of government schools. The major findings of the study were (i) Girls of aided schools differ in attitude towards CAL from girls of government schools. (ii) There are significant differences between boys and girls student” s of aided schools in respect of their attitude towards CAL. (iii) No significant difference is found between the boys and girls of government schools in respect of their attitude.

**Nirmala Sundararaj (2005)** conducted to assess the “Attitude towards Computer Education of the B.Ed. trainees of Tamil Nadu Open University. It was found from the results that (i) there is significant difference between male and female B.Ed. trainees in their attitude towards computer education. That is the female B.Ed. trainees are better than the male trainees. (ii) There is significant difference between rural and urban B.Ed. trainees in their attitude towards computer education. That is the urban B.Ed trainees have better attitude towards computer education than the rural trainees. (iii) There is significant difference between arts and science B.Ed. trainees in their attitude towards computer education.

**Sheela (2006)** examined on “Knowledge of Information and Communication Technology (ICT) and attitude towards teaching ICT among teacher educators”. The major findings of the study were (i) Teacher educators possessing good and poor knowledge of ICT differ in their attitude towards teaching ICT; teacher educators with good knowledge of ICT have more favorable attitude towards teaching ICT.(ii) Male and Female teacher educators do not differ significantly in their attitude towards
teaching ICT. (iii) Teacher educators from private aided and private unaided colleges differ significantly in their attitude towards teaching ICT: teacher educators from private unaided colleges were found to have more favorable attitude towards teaching ICT. (iv) A significant difference was found in the attitude of high experienced and less experienced teacher educators towards teaching ICT: teacher educators with less experience had more favorable attitude towards teaching roof than teacher educators with more experience. (v) No significant difference was found in two attitude scores of teacher educators of arts and science streams towards teaching ICT. (vi) Teacher educators from rural and urban areas did not differ significantly in their attitude towards teaching of ICT.

*Helen Joy (2007)* conducted a study on “Usage of Internet: Practices and attitudes of teacher trainees”. Results revealed that the study points to the need for having more refreshers or training programs for teachers to get familiar with computer. It was found that those who had more access to the computer having more favorable attitude towards using the computer also points to the same. Computer assisted instruction and evaluation using computer related technology is widespread, and has been introduced in the evaluation of students at the tenth standard level and teachers without favorable attitude towards CAI may pose a problem in the effective implementation of the program at the school level.

*Neelam and Sushanta Kumar (2007)* focussed on “Attitude of Postgraduate Students towards Internet. The results found that (i) postgraduate students have more favorable attitude towards the Internet. (ii) There is no significant difference between the attitude of male and female postgraduate students towards the Internet. (iii) There is no significant difference between the attitude of rural and urban postgraduate students towards the Internet. (iv) There is no significant difference between the attitude of Arts and Science postgraduate students towards the Internet. (v) There is no significant difference between the attitude of Science and Commerce postgraduate
students towards the Internet. (vi) There is no significant difference between the attitude of Arts and Commerce postgraduate students towards the Internet.

**Vandana and Newa (2009)** conducted to examine the “School teacher” s attitude towards ICT”. The main findings of the study were that private and secondary school teachers exhibited comparable attitude towards ICT. Teaching belonging to different academic streams, viz, language, science, mathematics and social sciences exhibited comparable attitude towards ICT. They found the school teachers exhibited positive attitude towards ICT. Therefore ICT must be given higher priority in teacher education curriculum. So that the future teachers can cope with various challenges in education system, more specifically the new roles of teachers in ICT based teaching learning system. Also in-service teachers must be given training to teach in ICT based instructional settings.

### 2.6 Studies related to Computer & Gender.

**Fowler (2002)** undertook a study to determine if students' computer attitudes varied based on gender. The results indicated that there were no significant gender differences found; this result, differed from the review of literature, which stated that males report more positive attitudes.

**Jung (2004)** found that male students were significantly higher on the overall technology disposition scores than female students, but the differences were due to their strong self-concept, especially self-confidence, which was the subset of self-concept. In another study (Markauskaite, 2006) gender differences in self-reported ICT experience and ICT literacy among first year graduate trainee teachers were investigated. Dynamic model of ICT literacy is employed. Three main components of aspiring teachers ICT literacy are covered: (1) present general problem-solving and technical ICT capabilities; (2) situational and longitudinal sustainability; and (3) transferability of ICT capabilities into future professional domain. No significant differences were found between females and males previous experience with ICT.
However, males on average worked with computers significantly more hours per week than females. Significant differences between males and females technical ICT capabilities and situational and longitudinal sustainability were observed. Males’ scores were higher. In the regression analysis, when the impact of the background and ICT experience variables was controlled, gender failed to be a significant predictor of the sustainability scores. However, it remained a significant predictor of some trainee teachers scores, related to their technical ICT capabilities. Morris (2002) study was aimed at identifying relationships between the variables of gender-identity, learning-style, computer anxiety-apprehension, and attitude about computers. The interaction effects of learning style with gender identity on computer anxiety-apprehension and attitude about computers were not significant. MANOVA analysis found significant main effects for gender-identity on computer anxiety-apprehension and attitude about computers. The main effect of gender identity on computer anxiety-apprehension was significant at the p<.05 levels. Using the Scheffe multiple-comparison procedure, this study revealed significant mean differences between the undifferentiated gender-identity and the androgynous, feminine, and masculine gender identities. The main effect of gender identity on attitude about computers was significant at the p<.05 levels using the Scheffe multiple-comparison procedure, this study revealed significant mean differences between the undifferentiated gender-identity and androgynous and masculine gender-identities. In addition, this study revealed significant mean differences between the feminine (M = 107.80) and masculine (M = 116.67) gender-identities.

Porfilio (2004) examined White female pre-service teachers' perception and experiences in relation to computers and male-centred computing literature. The data collected in this study came through the methodology of qualitative research. During the fall 2002 and spring 2003 terms, in-depth individual interviews and focus group interviews were conducted with white female pre-service teachers at Border College, a small independent coeducational institution of higher learning. The study was informed by feminist research methods, as gender was not at the forefront of the
research process. The data reveal that the majority of participants hold a non-critical view of computing technology and its male-centred culture as well as lack the confidence to utilize computers within elementary classrooms. Their stories suggest they have internalized techno centric discourses, which position computing technology as an omnipotent artefact, allegedly having the power in and of itself to improve society as well as the power to wash away pervasive social ills, such as poverty, racism and sexism. Moreover, the participants' narratives establish that their lack of confidence and critical insight vis-a-vis technology is mediated by the lack of educative experiences at Border College, within elementary classrooms, and in their social worlds. In juxtaposition, several participants held a more critical, informed view of technology and its masculine culture. By reflecting upon their lived experiences in the business world, their friends' and families' computing practices, and their own computing use, the participants determined that corporate entities are the main beneficiaries of computing in today's society. For several future teachers, the research process itself served as an educative site. By the end of this study, they garnered newfound insights in relation to the entrenched nature of gender inequity in today's schools and society. These women seem to possess the critical insight needed to create symmetrical computing relationships in the classroom, to inform youth of the social and economic processes which influence how computers are used in various social contexts, and to dismantle systemic barriers and unjust practices that fuel social and educational inequalities across the globe.

Gender differences over many computer related variables have been explored by the researchers. Gender differences were reported in computer attitude (Carter, 2004; Morris, 2002), technical ICT capabilities and situational and longitudinal sustainability (Markauskaite, 2006), computer competency (Chen, 2005) and technology disposition scores (Jung, 2004) in favour of males. But one research reported (Fowler, 2002) absence of such a difference. Gender found to make significant contributions in predicting computer attitudes (Chang, 2005) but failed to be a significant predictor of ICT capabilities. Computer anxiety apprehension was
found to influence by gender identity (Morris, 2002). There were no researchers found which explored the influence of gender on computer knowledge, computer skills and computer self-efficacy.

**Carter (2004)** determined what factors caused a gender disparity in an eighth-grade computer technology classroom in a large-sized public school district in western Arkansas. A qualitative case study was conducted utilizing observations, interviews and reviewing current and historical documents at the case study site. Fifteen different observations were conducted in the computer technology classroom with the focus being on at least two of the four observed areas - individuals/groups, setting, language and interactions. The computer technology instructor, counsellors, principal and eighth-grade enrolled and non-enrolled students were interviewed formally and informally. Reviewed documents were pre-registration forms and past and current enrolment forms. At the case study site, it was determined scheduling conflicts played a large part in the enrolment disparity of the computer technology class. However, other areas indicated a difference in the attitude and use of male and female students and how they utilized their class time to work with computer technology. Also, during the observation time period, male students received 71.43% of the computer technology instructor’s assistance, while females received assistance 28.57% of the observed time. Teacher's questions were responded to by males 72% of the observed time, while females responded 28% of the observed time. Male students volunteered to assist in class 69% of the time compared to the females who volunteered 31% of the observed time.

A study by **Chang (2005)** investigated the influence of gender on students' computer attitudes and their perceptions of the usefulness of computers. The results indicated that gender found to make significant contributions in predicting computer attitudes.
A study by Chen (2005) explored the factors that have an effect on technology competencies for pre-service teachers, in an effort to delineate those factors that contribute to increased competency. Mean scores of technology competency and experience (use, coursework, and integration) differed significantly by gender. In general, male participants, seniors, and who were in Programme a self-reported higher scores on these variables.

Adebowale, Adediwura & Bada (2009) found no influence of gender on computer attitude, computer self-efficacy and computer anxiety. In “A case study of attitude and use of computer technology in one eighth-grade classroom”

2.7 Integration of ICT in Teaching

Studies Done in Abroad

Frederick and Kwame Ansong-Gyimah (2010) conducted study to assess the perceptions of students, teachers, and educational officers in Ghana on the role of computer and the teacher in promoting the first five principles of instruction. The perception of 395 participants (students, teachers and education officers) in Ghana were examined the role of the computer and the teacher in promoting the first five principles of instruction for quality teaching and learning. The results of the study indicate that there were perception dissimilarities among the participants on the role of a computer and a teacher in implementing the first five principles of instruction. In addition, according to the findings, there is a mismatch of participants” recommendations on training students to acquire computer skills, and training teachers to acquire skills in designing their teaching.

Myung-Geun Lee (2003) did a comparative study to find the ICT Integration Initiatives in Korean, German and American Educations. Convergences were found especially in terms of intervention of central government and the spectrum of core policies. Divergences were found especially in implementation 82 approaches and processes of policy decision-making regarding ICT integration into education.
Comparing divergences among the three countries reveals common tasks for which they may cooperate on in order to resolve mutual problems. Through the observation of school sites of each country, as well as related literatures, one can see that ICT integration is still far from being satisfactory. Thus, it is implied that, in addition to individual countries’ efforts such as increasing teacher training, diverse international cooperation focused on common problems must be devised among the three countries.

Lorrae Ward (2003) studied on “Teacher practice and the integration of ICT: Why aren't our secondary school teachers using computers in their classrooms? This study focused on secondary school teachers to find the practice and the integration of ICT. Data obtained during this study regarding the current levels and types of use as well as potential constraints are discussed. Findings from the study support the contention that there is only limited use of computers in classroom practice. They also show that there is a clear need to do more than provide infrastructure and professional development if this level of use is to increase and the current level of expenditure to be justified in terms of improving teaching and learning.

Robert, Peter and Joseph (2004) conducted a study on 439 primary and secondary students to examine the ICT learning in the classroom: The influence of students, the class-group, teachers and the home. A model of classroom ICT classroom learning culture inclusive of the influence of the individual student, the class-group, the teacher and the home ICT environment was conceptualized. Results obtained that students generally expressed confidence in their capacity to use ICT in their learning, but were less certain about the extent to which this learning was supported by teachers and parents. The analysis also shown that attributes of the individual student were more influential than those of the classgroup and of the teacher on effective ICT learning. The home ICT environment was shown to mediate the influence of individual student ICT learning behaviours on the development of positive attitudes towards the use of ICT at school.
Nwachukwu Prince Ololube (2006) studied on “Appraising the relationship between ICT usage and integration and the standard of teacher education programs in a developing economy”. This research endeavor might have made a considerable stride in the understanding of the impact of ICTs on teacher preparation towards producing a new caliber of teachers whose professional ability are very essential in a developing economy. However, it would be very useful to further probe some of the findings that have emerged in this study.

Hadjerrouit (2008) designed an exploratory study on using a Learner Centered approach to teach ICT in secondary schools. It can be ascertained that student teachers made a real progress in their attempt to apply the ICT teaching method in their classrooms. To exploit the full potential of the method in future experiments requires the stakeholders involved in teacher education and secondary schools to be initiated into all its aspects. The implementation entails taking into consideration both internal and externals factors affecting the introduction of innovative ICT teaching methods, changing the stakeholders” views and practices to help them integrate innovative ICT pedagogies into secondary school environments.

Jotondeur, Hilde, Johan and Martin (2008) focussed on “ICT integration in the classroom: challenging the potential of a school policy. Results found that the potential impact of policy related factors on the actual integration of ICT in daily classroom instruction. The findings suggested that successful ICT integration is clearly related to actions taken at the school level, such as the development of an ICT plan, ICT support, and ICT training. The results also suggest that principals have to develop a more – collaborative approach when defining this policy. This study underpins the importance of a shared and school wide vision about ICT integration that reflects the opinions and beliefs of the principal, the ICT coordinator and the teachers.

Mohamed Maiga, Tchombe and Toure (2008) studied on “Getting ready for higher education: the role of ICT in secondary schools”. It was obtained from the
results that the use of ICT can help secondary school students develop the cognitive skills necessary for higher education and for life when accompanied by appropriate pedagogies in school. They suggested that Teachers who pedagogically integrate ICT into their curriculum nurture student learning in a variety of ways. Moreover, they tend to embrace more open teaching strategies that help prepare high school students for a world that will never stand still, and where learning becomes a dynamic process. It is not how much we know that matters, but how well we learned how to learn, and how well we can adapt, communicate and create. African students are using ICT to engage more actively in their learning. These new trends in education need to be understood by teachers so they may maximize the benefits of ICT for pedagogical reform and improved quality of education.

Guoyuan, Martin, Johan and Jolondeur (2009) found that that successful ICT integration is clearly related to the thinking processes of classroom teachers, such as teacher beliefs, teacher efficacies, and teacher attitudes toward ICT. The results underpin the importance of an integrated and concurrent understanding of teachers thinking process. They also suggest that in order to improve the innovation of classroom activities, teachers thinking processes should be challenged.

Daniel Light (2009) did a study to examine the role of ICT in enhancing education in developing countries. Results obtained that Teachers reported that they developed the skills needed to initiate or increase the use of ICT with students. Most of the teachers in India and Turkey reported little ICT experience before Essentials, whereas most Chilean teachers had previous trainings and experience using ICT. Regardless of their experience with ICT, all teachers we interviewed who took the Essentials Course reported they increased their knowledge of how to use ICT as an educational tool. For teachers with no prior experience, the Course helped them acquire basic skills. However, all of the teachers commented on how the Course helped them see ICT as a pedagogical tool. The strategy of having teachers design a model unit of their own choice appears to allow teachers to work on skills and areas that are new and challenging for them.
Guoyuan, Sang, Martin, Johan, Jotondeur and Chang (2010) found that classroom use of ICT directly depends on teacher’s computer motivation and the supportive use of ICT. Teacher’s constructivist beliefs, their attitudes towards computers in education and perceptions about the ICT related school policy influence ICT integration in and indirect way. An indirect relationship was found between teacher’s constructivist beliefs and their level of ICT integration.

Studies Done in India

Jyothi (2007) designed a research method to investigate the “Impact of computer based learning on students of chemistry”. Results revealed that the self instructional module prepared by a teacher through power point presentation had immense positive impact on learning of chemistry. The preparation of this module is very easy and simple it has opened a new way and is very much helped to teachers in their physical sciences instruction.

Rachana Rathore (2007) studied on “Effective teaching through e-learning”. The author emphasized that the utility of e-learning in making teaching effective, and the challenge of educational organizations that aspire to provide e-learning in India is to get a good program that meets the learners needs and then makes the cultural changes in the way they learn. India is a multilingual country and most of e-learning or India knows vernacular languages. However the content of e-learning or e- education is only in English. Hence to make e-learning successful in India the digitized text has to come in these languages also rural India can benefit only by establishing e-learning centers with content in local languages and the users would be able to cross cultural boundaries by collaborating with learners form others cultures thereby reducing the gap of digital divide.

Manojkumardash (2007) carried a study on “Integration of ICT in teaching learning” a challenge. It was found that Information and Communication Technology is an important instrument that can transfer the present isolated, teacher centered and
book centered learning environment into a student centered environment, and the author avers that ICT can change the traditional concept of learning process. They conclude that ICT helps in the professional development of teaching and learning and individuals involved in the programs of teacher education. It can be infused in the learning process so as to acquire the knowledge and skill efficiency. ICT provides access to resources so that teachers, can apply new knowledge and skills they have learnt. Communication technology will be able to develop the capacity of the teacher and teacher educator and at the same time can strengthen the capacity of teacher educator, which is the fundamental requirement of effective transactional strategy.

Nimavathi and Gnanadevan (2008) conducted a study on “Effectiveness of Multimedia Programme in teaching science with a set of children studying in the ninth standard” and finding out its effectiveness over the conventional method of teaching pretest-post test equivalent groups design was followed for this study. Results found that the multimedia programme prepared by the researcher is more effective for the achievement in science of ninth standard students. The students learning through multimedia programme are found to be better than the students learning through the conventional method of teaching. The major findings of this study were i) there is no significant difference between the experimental group and control group in the achievement of science at pretest level. (ii) There is a significant difference between the experimental group and control group in the achievement of science at post test level. The students learning with the help of multimedia program fared better in science than the students learning through the conventional method. (iii) There is a significant difference between the mean achievement test scores of the pretest and post test for the experimental group. This shows that the multimedia program has helped the students to score more marks in the post test.

Kamalnayan (2008) studied on “Implications of Information Technology for teacher education and research”. The study found that bulk of the faculty currently engaged in teacher preparation is neither prepared to use technologies not has it
updated its knowledge on technological developments. Universities and teacher education institutions would require a significant commitment to provide training for faculty staff, and to provide resources. Unless substantial effort is made on the part of universities, teacher educators and trainees alike will be deprived of the joy of using ICT.

**Namita and Deepshikha (2009)** conducted on Analysis of e-education: Developing as a Potential Learning System in Jammu Region: India. This study revealed that identified five specific areas where changes in the role and attitude of academic staff in tertiary institutions were necessary to accommodate e-teaching and the acceptance of the associated technologies. These changes highlighted the need to look at the course in a new way and re-think and adapt existing course delivery, Move from being a content provider to a content facilitator who has a good knowledge of their subject area, Gain proficiency in using the tools so that there is an understanding of both its strengths and its weaknesses, Learn to teach in absence of face-to-face interaction. And Gain an understanding of students' needs and lifestyles in their own communities. The author has proposed a model which is not only catering to the basic educational needs, but also to their need for career or future growth has also been taken care of. It is high time that we integrate the education and career options for the people of Jammu instead of segregating them.

**Vimal Kumar (2010)** designed on “Integration of ICT in teacher education computer assisted instruction and E-learning”. He found that the students taught by computer assisted instruction method performed well than the students taught by conventional method in learning the concepts of universe. The study found favorable result and the students found to be interested to learn through CAI. Government may distribute CAI packages of all subjects to all schools that they can use it their daily teaching learning process.
2.8 Review Related to Barriers in integrating ICT

UNESCO (2002) provides the framework for establishing ICT into education but this is a slow process filled with many barriers. Pan (2000) states five of the obstacles Faculties of Education have had in infusing technology into their programs: 1) lack of financial resources to support ICT, 2) faculty being out of touch with the reality of the school, 3) inadequate faculty development and time allocation to support ICT in teacher education courses, 4) strong resistance from some faculty to adopt ICT into their teaching and/or are reluctant to participate, and 5) a lack of plans excluding preservice and inservice teachers, students and the local community (Pan, 2000).

Steps were taken at the School of Education at the College of New Jersey to restructure the teacher education program with computer technology integration. There are no details of the size of the college, the number of faculty involved, if it was a ubiquitous laptop program or the amount of instructional hours in the computer course. The plan involved using faculty development to educate a group of preservice teachers to become technology experts and become the task force in shifting the focus on technology from the faculty to the preservice teachers. The plan involved having: a) preservice teachers’ peer mentoring and support system, b) cooperation and collaboration between preservice teachers, faculty, ICT team, teachers, community and industry, and c) computer course revision (Pan, 2000). The importance of faculty development and a plan to involve others in the goal of integrating ICT are transferable concepts to a ubiquitous environment. A faculty survey found that the teacher education faculty needed help with ICT and wanted specific examples of integrating ICT into the curriculum. In a preservice 49 teacher survey, computers were used for mainly, surfing the web, email and typing papers. Many preservice teachers lacked skills and knowledge of ICT integration into the curriculum. Visits to the classrooms where preservice teachers were practice teaching yielded anecdotal evidence that only a minimum of ICT integration was occurring in the regular classroom and that the preservice teachers did not have opportunity to use computers in their teaching (Pan, 2000). A few suggestions were made by Pan (2000) in addressing some of the issues such as preservice teachers taking a basic computer
literacy course where they learn about different applications, create web pages and create multimedia presentations. He also suggested integrating technology into each of the courses. The concern of simply requiring professors to integrate ICT and assigning technology based tasks may cause problems if the preservice teachers do not have the skills to complete the tasks, such as web page creation. Faculty had resistance to technology integration due to the amount of time and effort required to learn the technology. There is a lack of incentives to motivate faculty to participate in ICT integration. There was inadequate ICT technical support, training and lack of resources. When preservice teachers from the computer literacy class worked with faculty, the faculty learned about the convenience and importance of web pages as well as PowerPoint presentations. Follow up literature on this project was not found in an electronic search (Pan, 2000). Additional and similar barriers were found by Rogers, (1999) who examined barriers to technology adoption based on a search of the literature and the results of two studies, K-12 teachers and higher education faculty in the United States. A meta-analysis of the literature addressed ten barrier category items including: 1) availability and quality of hardware/software, 2) faculty role models, 3) funding, 4) institutional support, 5) models for using technology in instruction, 6) staff development, 7) student learning, 8) teacher attitudes, 9) technical support, and 10) time to learn to use the technology (Rogers, 1999). The barriers to ICT adoption are a combination of many factors. Rogers (1999) classifies the barriers of successful technology adoption into two main categories: internal and external. Internal barriers can be combined together as teacher attitude and 50 perception towards technology. External barriers are categorized into three areas, availability and accessibility, technical and institutional support, and stakeholder development. There appears to be a strong interaction and interdependence among the three external barrier categories. The barriers that cross internal and external sources are lack of time and funding (Rogers, 1999). He makes several recommendations in technology planning to avoid some of the barriers: 1) determine the goals of teaching and learning first, 2) assess the technology adoption of the stakeholders, particularly the faculty and staff, 3) assess the attitudes of the stakeholders toward technology in education,
4) consider the three barriers to technology adoption, availability and accessibility, technical and institutional support and stakeholder development simultaneously, and 5) technology plans must include a consideration of time and funding issues. The act of integrating ICT into teaching and learning is a complex process and one that may encounter a number of difficulties. These difficulties are known as "barriers" (Schoepp, 2005). A barrier is defined as "any condition that makes it difficult to make progress or to achieve an objectives" (WordNet, 1997, as cute dub Schoepp, 2005, p. 2.).

**Classification of the barriers:-**

Several studies have divided the barriers into two categories: extrinsic and intrinsic barriers. However, what they meant by extrinsic and intrinsic differed. In one study, Ertmer (1999) referred to extrinsic barriers as first-order and cited access, time, support, resourses and training and intrinsic barriers as second-order and cited attitudes, beliefs, practices and resistance; whereas, Hendren (2000, as cited in Al-Alwani, 2005) saw extrinsic barriers as pertaining to organizations rather than individuals and intrinsic barriers as pertaining to teachers, administrators and individuals. Another classification found in the literature is teacher-level barriers versus school-level barriers. Becta (2004) grouped the barriers according to whether they relate to the individual (teacher-level barriers), such as lack of time, lack of confidence, and resistance to change, or to the institution (school-level barriers), such as lack of effective training in solving technical problem and lack of access to resources. Similarly, Balanskat et al. (2006) divided them into micro level barriers, including those related to teachers' attitudes and approach to ICT, and meso level barriers, including those related to the institutional context. The latter added a third category called macro level (system-level barriers), including those related to the wider education framework.
i) Teacher-level Barriers

Lack of teacher confidence: - Beggs (2000) asserted that teachers' "fear of failure" caused a lack of confidence. On the other hand, Balanskat et al. (2006) found that limitations in teachers' ICT knowledge makes them feel anxious about using ICT in the classroom and thus not confident to use it in their teaching. Similarly, Becta (2004) concluded their study with the statement: "many teachers who do not consider themselves to be well skilled in using ICT feel anxious about using in it front of a class of children who perhaps know more than they do"

Lack of teacher competence: - Another barrier, which is directly related to teacher confidence, is teachers' competence in integrating ICT into pedagogical practice (Bect, 2004). In Australian research, Newhouse (2002) found that many teachers lacked the knowledge and skills to use computers and were not enthusiastic about the change and integration of supplementary learning associated with bringing computers into their teaching practices. Current research has shown that the level of this barrier differ from country to country. In the developing countries, research reported that teacher's lack of technological competence is a main barrier to their acceptance and adoption of ICT (Pelgrum, 2001; Al-Oteawi, 2002). Insyria, for example, teacher's lack of technological competence has been cited as the main barrier (Albirini, 2006). Likewise, in Saudi Arabia, a lack of ICT skills is serious obstacle to the integration of technologies into science education.

Resistance to change & negative attitudes: - Much research into the barriers to the integration of ICT into education found that teachers' attitudes and an inherent resistance to change were a significant barrier. From his / her analysis of the questionnaires, Gomes (2005) found that science teachers' resistance to change concerning the use of new strategies is an obstacle to ICT integration in science teaching. Schoepp's study (2005) found that, although teachers felt that there was more than enough technology available, they did not believe that they were being supported, guided or rewarded in the integration of technology into their teaching.
According to Empirica (2006), teachers who are not using new technology such as computers in the classroom are still of the opinion that the use of ICT has no benefits or unclear benefits. According to Earle (2002), the change from a present level to a desired level of performance is facilitated by driving (encouraging) forces such as the power of new developments, rapid availability, creativity, Internet access, or ease of communication, while it is delayed by resisting (discouraging) forces such as lack if technical support, teacher expertise, or time for planning. In their study, Cox et al. (1999a) found that teachers are unlikely to use new technologies in their teaching if they see no need to change their professional practice. They showed that teachers who resist change are not rejecting the need for change but lack the necessary education in accepting the changes and are given insufficient long-term opportunities to make sense of the new technologies for themselves.

ii) Student-level Barriers

Lack of time:- Several recent studies indicate that many teachers have competence and confidence in using computers in the classroom, but they still make little use of technologies because they do not have enough time. A significant number of researchers identified time limitations and the difficulty in scheduling enough computer time for classes as a barrier to teachers' use of ICT in their teaching. According to Sicilia (2005), the most common challenge reported by all the teachers was the lack of time they had to plan technology lessons, explore the different Internet sites or look at various aspects of educational software. According to Al-Alwani (2005), lack of time is a barrier affecting the application of ICT in Saudi Arabia because of busy schedules. He indicated that because Saudi teachers work from about 7:00 a.m. until 2:00 p.m. and the average number of class sessions taught by science teachers is 18 per week, both teachers and students have a limited number of hours during the day to work on integrating ICT into science education. Similarly, in Canada, Sicilia (2005) concluded that teachers take much more time to design projects that include the use of new ICT than to prepare traditional lessons. Teachers interviewed by Sicilia (2005) commented that "the constraints of different class schedule [sic] contributed to the lack of time they spent together to work on planning classroom activities".

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**Lack of effective training:**- The barrier most frequently referred to in the literature is lack of effective training. One finding Pelgrum's (2001) study was that there were not enough training opportunities for teachers in the use of ICTs in a classroom environment, Similarly, Beggs (2000) found that one of the top three barriers to teachers' use of ICT in teaching students was the lack of training. According to Becta (2004), the issue of training is certainly complex because it is important to consider several components to ensure the effectiveness of the training. These were time for training, pedagogical training, skills training and an ICT use in initial teacher training. According to Newhouse (2002) teachers need training in technology education (focusing on the study of technologies themselves) and educational technology (support for teaching in the classroom) Other problematic issues related to professional development in ICT are that training courses are not differentiated to meet the specific leaning needs of teachers and the sessions are not regularly updated (Balanskat et al. 2006)

**Lack of accessibility:**- Several research studies indicate that lack of access to resources, including home access, is another complex barrier that discourages teachers from integrating new technologies into education. In Sicilia's study (2005), teachers complained about how difficult it was to always have access to computers. The author gave reason like "computers had to be booked in advance and the teachers would forget to do so, or they could not book them for several periods in a row when they wanted to work on several projects with the students"

2.9 **Implications of review of related studies to the present study.**

Investigator has reviewed the literature related to the study in the area of ICT awareness, use and need of teachers. There are numbers of studies available on ICT but in this chapter only those studies are reported which are relevant to the present study. The studies have been reported in a precise manner and an attempt has been made to develop holistic perspective of the findings in order to explain the relationship with the present study.
• On the whole, it can be said that majority of the studies are related to the ICT awareness and use of teachers.

• Most of the studies are related to computers and Internet.

• Most of studies are done in abroad and very few studies are done in India.

• Most of the studies were found to be survey type of work.

• Most of the studies have tried to come out with the findings in terms of ICT awareness, use and need of teachers.

• Questionnaire was used for data collection in most of the studies

• Variables taken in most of the studies were gender, experience, designation, qualification, socio-economic status etc.

• In most of the studies statistical techniques like frequency, percentage mean, standard deviations, Chi-square, ‘t’ values, ANOVA etc. were used for data analysis.

• Some of studies revealed that 100% ICT awareness of ICT prevailed among the teachers while some other studies revealed moderate or less awareness of teachers about ICT.

• Most of the studies revealed that the use of technology is more among the young teacher in comparison to the old teachers.

• Use of technology was found more among teachers in abroad where as less usage of technologies were found among Indian teachers.

• Very few studies are conducted on ICT need of teacher. From the available studies it was found that a large number of teachers are not using technology because of the lack of skill or the lack of resources.