Chapter- 2
Review of the Related Literature
Once having defined the problem, the investigator is naturally eager for action. The topic must be related to relevant knowledge in the field. It is important for educators and others engaged in research to know how to locate, organize and use the literature in the field.

Reviewing the related literature helps the researcher to understand the researches already done in the similar area, the methodologies adopted, the findings, the generalizations made and the research possibilities.

Knowing what data are available often serves to narrow the problem itself as well as the technique that might be used (Kumar, 2008).

Reviewing the related studies implies locating, reading and evaluating the reports of research as well as casual observations and opinions that are related to individual planned research work. Thus the review builds the background for the study in hand.

In an attempt to review the related researches, the investigator scanned the literature. Though it is not possible to have a water-tight compartmentalization, still the studies which researcher has come across are on various aspects of ICT like implementation of ICT projects, Computer Literacy Education including infrastructure, access and use of ICT, Infrastructure for ICT, Teacher-training related to ICT, Computer Assisted Instruction (CAI) and comparison of ICT plans. The studies which bear some relationship with the present study and had been carried out by other researchers are given as under:

Tengku (1981) conducted a study on teachers' perceptions about the implementation of a National Computer Education Project in secondary schools in Malaysia. It was found that the main obstacles for the implementation of the Project were: teachers' lack of knowledge and skills in the curriculum content, problems with hardware, lack of reference materials, students' weaknesses in English or overall academic achievements and inadequate time allocation for teaching the subject. The study drew several conclusions related to computer implementation in schools and staff development. It was suggested that implementing a computer curriculum in
schools should be based on clearly defined educational objectives and computer in-service training programmes should have at least two characteristics out of the following:

(i) The concerns and needs of the teachers involved should be basis for staff development programmes in computer literacy.

(ii) In-service training should be linked to instruction and should have clear and relevant objectives.

(iii) The availability of adequate educational resources is essential for introducing change related to computing.

Bonner (1987) identified six important elements of computer literacy one of which was describing instructional and non-instructional uses of computers. In describing instructional and non-instructional uses, the principals in the study reported that applications which allowed students to manipulate the computer and use it as a tool were the most common instructional uses. Uses which processed large amounts of data were the most common in the non-instructional areas.

Godett (1987) studied the problems inherent within the structure of education and found that the potential for its compatibility with technology revolve around the inflexibility of students’ and teachers’ scheduling and the availability of sufficient facilities for computer technology to be addressed effectively. Experts and educators were found to identify the inadequacy of available software as another hindrance to the blending of education and computer technology.

Modaress (1987) in a study found that availability of older technologies was more than the newer ones. Audio and video tapes, slides, computer software and programmed instructions were held by few media centres. Evidence suggested that many of the universities had not received necessary support. According to the findings of the study the insufficient budget, at least in part, was responsible for the lack of media facilities in the classroom, instructional materials and media equipments.

Beaver (1988) identified the common characteristics of the quality computer programmes. 73 schools were identified and surveyed (with a 70 percent response rate) using an instrument designed to gather data on selected topics: important contributors and barriers to computer program improvement, available computer time
allocation, budgetary considerations, school planning process characteristics, time period for which schools have had computing program, type and location of computers, extent of staff involvement and computer uses considered as the most important in facilitating student learning. It was found that computer access time was allocated to computer assisted learning (55 percent) and applications (29 percent) with less time to computer programming (14 percent). The computers, overwhelmingly Apples IIes, were situated in both computer labs and class rooms. The instructional leaders identified word processing as the most important current use of computer. The respondents projected that computer uses required more hardware and teacher training than present utilization modes.

Oppenheimer (1988) studied the reasons for computer utilization reluctance by teachers with computer training. 150 elementary school teachers in an urban school district responded to a thirty items questionnaire. Findings indicated that male teachers, with less than 15 years experience and teachers in grades 4-6 were less reluctant to use computers. Many teachers felt that training had been inadequate; too much material was covered in the training sessions and their follow up was poor. Software was considered plentiful and appropriate. Teachers agreed that students had great interest in using computers.

Al-Furiah (1989) investigated the attitudes, needs and obstacles encountered by teachers implementing a government mandated computer literacy curriculum in secondary schools in Kuwait. An attempt was also made to study the influence of teachers' background and training on the perceptions of the computer literacy curriculum and teachers' perceptions of students' attitudes toward this innovation. Data were collected through a questionnaire distributed to 56 teachers in 32 schools. Teachers endorsed the value of having a computer literacy curriculum for all secondary school students in Kuwait. Teachers were not found satisfied with the content of the curriculum. Teachers with computer science background felt the need for training more focused on teaching methods appropriate to the computer literacy curriculum and with less focus on curriculum content. Teachers without a background of computer science felt the need for both types of training. Need for more support from principal to the teachers was reported by them to reinforce the importance of computers in daily life activities. Teachers were of the view that Kuwaiti Ministry of Education should provide:
(i) Accessible instructional resources to support the computer literacy curriculum and

(ii) Training based on actual needs of teachers.

The main obstacle reported by teachers was the inadequate prerequisite skills of students. Specifically, teachers felt that students needed more preparation in maths, English and key boarding to be successful in this curriculum.

Foster (1989) in a study found the factors that contributed to an individual teachers' degree of microcomputer use. The factors were (a) Change in an individual's decision making process; (b) Majority of the computers were located in the laboratories; (c) Teachers were having problems gaining access to computers and quality software; (d) Inadequate and inequitable funding across districts; (e) Teachers' heavy work load limited the time available for in-service training; (f) In-service training to limited number of teachers; (g) A general resistance to change by the teachers; (h) A dichotomy of beliefs between administrators and teachers regarding the need for computers and; (i) An adequate supply of technical assistance from a variety of sources. The survey data showed that 64.6 percent of the teachers in this sample were using computers for at least one purpose and 45 percent had their own computers. Gender and age were not significantly correlated to degree of computer use.

Royston (1989) conducted a study to ascertain the extent of microcomputer use in Missouri Secondary schools and examined relationship between the extent of usage and selected principals and teacher characteristics. The findings of the study indicated that about half of the principals had not received training related to micro computers. The teachers indicated a slightly higher rate of training, but still about 40 percent had not received such training. Nearly half of the principals did not use micro computers or used them very infrequently. Over 60 percent of the teachers used micro computers fairly often. Small schools tend to had computers in the classroom, where larger schools centralized them in computer labs. The average number of hours of access was 20 hours per week. 30 percent of the teachers and 12 percent of the principals indicated that there was too little use of the micro computers in curriculum.
Salehnia (1989) studied the difference between perceptions of secondary school and area vocational school business teachers, who taught computer/data processing courses in Missouri, the trends and advancement of computer hardware technology and software technology and the use of these technologies in education programmes and business education programmes. It also focused on assessing the types of computer hardware and software being used and the computer/data processing courses being offered in secondary school and area vocational school business education programs. It was found that on an average, there were 12.6 computers available in the secondary school business education departments and 28.9 computers available in the area of vocational school business education departments. APPLE computers were used in majority of the secondary school computer/data processing programmes while IBM computers were used in majority of the area vocational schools. It was the anticipation of secondary school and area vocational school business Teachers who taught computer/data processing course that Missouri would require computer literacy courses as a part of secondary school graduation requirements and that computers/data processing Teachers would be required to obtain programme specific teaching certificates.

Bailey (1990) found that instructional technologies and the necessary support as advocated by Virginia Six-year Plan for Technology were highly useful and in the case of students’ access to micro computers, teachers’ training in technology and local division funding for technology were essential. The most important factors which had positive impact on the implementation of technology, as indicated by accumulative 71.6 percent of the respondents were availability of trained Teachers and provision of in service education programme. Lack of funds was the most frequently (94.9 percent) indicated factor hindering the implementation of technology.

Heidari (1990) conducted a descriptive study on the status of technology education in the State of Idaho. The population of this study comprised of all Idaho Industrial technology instructors and principals in the Junior and Senior High Schools. The researcher collected the data through the teachers’ and principals’ questionnaire by mailing it. The findings of this study were that more than half of the teachers (54 percent) indicated that they had an industrial technology education programme. Adequacy of funding in terms of teacher training and equipment needs, received the lowest agreement among teachers. Teachers had same level of difficulty in acquiring
high technology instruction information. Technology education had been implemented and was being taught throughout the State of Idaho. The data indicated that overall teachers had difficulty in the adequacy of funding for implementing technology on priority in terms of equipment needs, facility improvements and teacher training.

Sutherlin (1990) investigated computer use in Arkansas Secondary Schools. The survey was conducted on administrators and teachers in the Arkansas secondary schools to determine the ways computers were being used and the factors affecting that use. The research questions addressed the availability of hardware and software, the amount of time the computers were being used, the location of the computers, the general types of instructional programmes and educators concerns about the use of computers. It was found that the computers were primarily found to be located and used in the traditional computer areas, administration business education and computer science. Teachers used computer most often for management tasks. In majority of the schools, the computers were used less than 30 percent of the school time. It was also found that majority of the individuals with more computer training tended to use computers more. Those with the least training felt that more in-service training was needed. It was found that besides the need for more hardware and software in the schools, in-service training needed to be provided to both administrators and teachers in order to improve computer utilization.

Costello (1991) conducted a study to investigate what information based technologies were available in the homes and schools of third and sixth grade students and determine the competency of third and sixth grade students in using these technologies. The information based technologies that were included in the survey were computers, televisions, VCRs, telephones, radios, modems and videogames, answering machines, stereos and calculators. The sample included 836 third and sixth grade students from 10 schools of five school districts located in New York. The findings of the study revealed that majority of the students had most of the information based technologies in their homes whereas computers and answering machines were not found in the homes as well as other technologies. Modems were not present in the homes of most of the students. With the exception of the computer, information based technologies were found in the schools to a lesser degree than in the homes. Most of the students were found to have basic competency in the use of all
the technologies with the exception of the modems. More sixth grade students were at advanced levels than third grade students. Gender differences were evident only for the computers, video games and the answering machines.

Devoe (1991) in a study assessed the perceptions of Boston computer teachers concerning the teaching of computer literacy in their schools. A questionnaire was designed with three areas of Interest i.e. curriculum, facilities and policies. The data from Boston Computer Literacy Teachers ranked the three “Areas of Interest” with “Curriculum” most favourable and “Policies” least favourable. Middle school teachers with longer experience were most content with the current conditions. The teachers with an average (Four to six years) length of experience appeared to be the most disturbed, regardless of school level at which they worked.

Di (1991) identified: patterns of computer use, access, software availability and training; Patterns of selected personal and workplace characteristics of teachers’ and; the pattern of teacher’s instructional involvement when students used computers. Questionnaires were distributed to 716 teachers in 166 schools. Data were gathered from 51 percent of the teachers and 77 percent of the schools. Frequency data indicated that almost all teachers have some ability to operate a computer. More than one third had used a computer at home and more than one third had used a computer for personal and professional tasks in schools. More than half of the teachers had some computer training, considered themselves computer literate and had used computers for at least a year. Teachers reported that computers were typically used with Computer assisted instruction, drill and practice software, in a lab setting for less than an hour a week and for remediation in Mathematics or reading. Most teachers reported software availability. However, teachers also reported inadequate opportunity to preview software and inadequate access to computers for imparting instructions to the students.

Crain (1992) studied the instructional computers’ usage in vocational and technology education in Texas Public Schools. Data were gathered with the help of vocational and technology education computer questionnaire which was sent to 180 vocational administrators in Texas. It was concluded that:- (1) Funding was not a major factor in use of computer technology; (2) The larger school districts utilized computer hardware and software to a greater extent than other small size districts; (3)
The availability of teacher for computer literacy was not consistent between school districts.

Kim (1992) studied the current utilization, needs, attitudes and problems of instructional technology in Korean secondary schools. The findings indicated that audio tape and video tape recorders were the most frequently used instructional equipments in classroom in Korea. The three most desired types of instructional equipments for classroom use were the video recorder, computer for instruction and over head projector. The study stated that organized and constant support for in-service and pre-service training, that emphasized the practical utilization of technology, would enable teachers to increase their technology use in the classroom. It recommended that the school facilities were to be modernized to facilitate utilization of instructional technology. It was suggested that teachers needed to be made more competent through effective pre-service and in-service training programmes.

Loipha (1992) conducted a study on teachers’ perception of computer use in elementary and secondary classrooms in Thailand. Two forms of questionnaires were developed and administered to a randomly selected sample of 527 school teachers and 94 college instructors throughout the north-eastern area of Thailand. The major findings of the study were:

i) Majority of teachers worked in schools without computers. The schools where computers were present, the administrators provided information services and administrative encouragement for teachers to use computers. Only 24.86 percent of the school teachers in the sample used computers in their classrooms. Among users, the large percentage of teachers used computers for teaching Mathematics, Science and Computer Literacy. The purposes for use of computers most often were drill and practice, tutorials and problem solving.

ii) In schools where computers were present, most of them were located in computer laboratories. Very few schools had a computer in every class room. Most of the users were not satisfied with the amount of software available at their schools. Subsequently, the teachers’ greatest need was software, followed by the need for personal knowledge about computing and need for more computers.
iii) Teachers viewed computers as having a positive impact on education. They agreed that computers should be integrated into the teaching and learning of any school subject. In order to fully integrate computers into teaching and learning, however, teachers agreed that the curriculum should be revised.

iv) Teachers were interested in many computer related subjects. Regardless of the application type, teachers were interested in learning, how computers could be applied for instructional purposes.

Computer utilization in two elementary school compensatory programmes was studied by McConaghy (1992). The data were collected from 20 out of 21 South Carolina schools through telephonic interviews. It was found that schools used computers for a variety of programmes including programmes for the gifted, regular classroom, compensatory and special education.

Panteli (1992) investigated the current educational use and distribution of micro computers in the public elementary schools of New Hampshire. In the study, it was found that

(i) The predominant student/computer ratio in a given elementary school classroom in the 47 responding school administrative units (SAU) was 25:1.

(ii) 86 percent of the SAU’s had instructional computers in elementary school classrooms

(iii) 37 percent elementary school or 17 percent of the SAUs surveyed had computers in their libraries for accessing information from a database.

(iv) 82 percent of the school districts represented in the survey had a staff development programme focused on computer technology.

(v) 51 percent of the respondents reported that their computers were integrated as a learning tool in their elementary curriculum.

Pusiri (1992) studied the historical development, problems and trend of microcomputer use in education in Thailand. The study also compared the status of computers in education in Thailand with a few other countries in Asia and the Pacific region. The information about microcomputers collected in Thailand and other countries was analyzed and interpreted from the transcription of interviews, data from returned questionnaires and data gathered from related documents. The number of
computers per school ranged from 4 to 55 and the type of computer use included introduction to new skills, drill, practice and review. It was found that Thailand had a well developed computer curriculum but it lacked funding, personnel, standards and support from the government. The trends in computer education in Thailand were towards learning computer application rather than the programming. There was an increasing use of computer for management, administration and for several other kinds of school tasks, if only one or two computers were available in school. All the countries surveyed in Asia and Pacific region were facing the same problem of not having enough computers for instructional use and lack of qualified personnel. The trend of using computers in education had been shifting from training about computers (e.g. Programming) to learning with computers. Computer education in secondary schools in Thailand had progressed steadily since its first introduction in 1982. There was a well developed computer education curriculum, but standards need to be set and implemented. Furthermore, support and clear policy on computer education from the government was essential and vital to the progress of computer education in Thailand.

McCraw (1993) conducted a case study of rural elementary school teachers to find what they believed about computers. It was found that there was a need for a long term technology plan to be installed at the same time so that technology was acquired with regular evaluation for accountability structured into the plan. It was also necessary to provide technology training to both teachers and administrators in the school system to make technology plan effective. Administrators were urgently required to centrally update the school board about the needs and uses of technology in their schools.

Mahajan (1994) studied the effectiveness of computer instruction for teaching singular and plural at grade 2, and found CAI to be more effective than the traditional method.

Shah and Agarwal (1994) conducted a research study to evaluate teachers' attitude towards computer education as well as computer assisted instruction (CAI). They found attitude positive in all groups, though female teachers showed more positive attitude towards CAI.
In a study by Davis (1995), it was found that three quarters of the principals denoted that more money was to be allocated for technology in the future. Other findings which the data revealed were lack of networking capabilities in most secondary schools, the low percentage of teachers highly skilled in computer usage and the small number of computers available in secondary schools in Illinois. Inequity in use and availability of electronic technology was verified by the data.

Joshi and Mahapatra (1995) undertook a study relating to effectiveness of computer software. They found that students taught through software package significantly did better than those taught through conventional method.

Kibbi (1995) in a study analyzed educational computers' use in Lebanese urban private schools. It was found that Lebanon was still in the early stage of implementing computer use in the schools. This implementation lacked funding, qualified personnel and support from the government. It was found that Lebanon had no set or established computer curriculum. The study suggested that teaching of computer applications was more important than training personnel in computer programming. All of the countries surveyed in the study were facing the same problems of not having enough computers for instructional use and also lack of computer personnel.

A study to find technological developments in Texas Public schools was conducted by Ryan (1995). The findings of the study showed that in education, many new technologies were found in schools and there was a wider use of the IBM or IBM compatible computer than Macintosh or APPLE IIe. Nearly all schools in districts utilized the computers in classrooms in addition to the computer labs. Most administrative networks were used for Texas education agency data while classrooms used networking for e-mail and networked system. There was a close relationship between the number of students enrolled and technology.

Williams (1995) in a study investigated the factors contributing to successful implementation of computer technology in schools. It was found that staff development opportunities and the availability of software and hardware were among the factors contributing to the successful implementation of computer technology in schools.
Agrawal (1996 as cited in Thankchan B., 2012) in an evaluation study of the CLASS project found that students had a positive attitude towards computer learning regardless of the type of school.

Jakobsdottir (1996) studied the computer culture in an elementary school in terms of internal factors (students, social context, hardware, software, computer access and implementation) and external factors (culture, community, district, school, home environment). The staff and students were interviewed and students' attitudes were surveyed. Gender equity regarding computer use by girls appeared high in the school in spite of no special efforts to promote computer use by girls. Important factors contributing to the finding included relatively high computer access in the school and frequent use of computer tools (word processing and graphics). It was also found that computers were mainly used in computer labs and teachers indicated a preference for use of computers in a lab setting rather than use of classroom computers.

Johnson (1996) studied the adoption of internet in selected public high schools in north-west Ohio. It was found that the significant differences existed between Internet adopting and non-adopting teachers on the following barriers: (a) complicated software; (b) lack of time; (c) educational level; (d) source of internet training and; (e) location of internet access.

Alexander (1997) in a case study of Tennessee Technology Demonstration High schools revealed that despite school wide access to technology, a majority of teachers reported the lowest stages of concern. Significant correlations existed between teachers' past experiences and their use; and between support received by teachers and their attitude towards technology. Availability of resources influenced level of use and almost half of the teachers indicated low interaction. Five recommendations made were: (a) encourage teachers to keep learning; (b) provide opportunities for teachers to work together; (c) arrange for training sessions to be held on site; (d) provide teachers with computers at school and at home, if possible and; (e) offer support from every source possible.

Belvin (1997) studied access to educational technology in Tennessee schools. The study found that majority of the 21st century classroom computers were located in the self-contained classrooms (67 percent). More 21st century classroom computers
were placed in the Kindergarten to eight grades. The participants reported over 52,000 computers in schools for instructional use. Measurements of access were: students to computers (9:1); students to multimedia (20:1); students to the internet (60:1); students to local area network (21:1); students to older computers (16:1); and students to newer computers (23:1). The most common teacher training activity was local training on software packages.

Jaber (1997) in a study surveyed the factors which influenced teachers' use of computer based technology. The study revealed that computer access in the classroom influenced the frequency of its use for instructional activities. Lack of internet access and obsolete computer equipment resulted in a negative influence for the teachers. Teachers also expressed a desire for continuous type of training programme for the use of computers.

Morrow (1997) conducted a case study of six technology rich middle schools. The findings of the study were:

(i) The principal played a significant role in the development and implementation of technology in the school.

(ii) The use of technologies in the middle schools had a positive impact on the perceptions of teachers, students and the parents.

(iii) Middle schools identified as technology rich incorporated a variety of technology driven tools that included computers, video distribution systems, communication systems, networking and instructional/satellite Television.

Rapp (1997) in a survey studied the factors affecting computer implementation in rural North-East Tennessee K-12 Public schools. The study led to the following conclusions:

i) The overall level of access to computer hardware and software in individual school was not adequate, if computer technology was to become part of student learning.

ii) The schools were providing little or no teacher training in using computer technology for lesson planning, delivery of instruction, research or to promote hands on student learning.
Satararuji (1997) analysed Thailand Information Technology Campus Project and studied assessment and implementation factors in it. The results of the study showed that effectiveness of policy implementation was hampered by policy ambiguity and led to delays in funding allocation. The situation was further compounded by frequent changes of top Government policy makers, which in turn led to breakdown in communication and a lack of cooperation between the Ministry of University Affairs and the participating Universities.

Schutz (1997) studied the perceptions of classroom teachers of selected rural school districts in East Tennesse about the impact computers had on instruction in grades five through eight. The findings of the study revealed that there had been very little development of computer use in the classroom. It was concluded that until students had access to sufficient equipment, software and training, the computers’ use was undeveloped.

Vojtek (1997) studied the role of computer co-ordinator in the implementation of the internet as a tool for school improvement and school reform. The findings of the study indicated that context of technology showed that in many organizations, the equipment was outdated, often with computers older than students. Students’ access was limited to few computers in a building, incompatible software and teachers’ knowledge, attitudes and skills. Other findings indicated that technology support in a District was not likely to increase with additional computers and networks. It was found that few classrooms were connected to the internet and access to technology was not equitable across or within District. There was bottom up and top-down support for technology, however, with students being among the greatest advocates and catalyst for change. Implications suggested that although technology was expensive, Districts were to include these items in their budget for upgradation. Staff development was to occur simultaneously with acquisition of hardware, software and network connections, technology training needs were to be embedded in content and research based instructional strategies and districts were required to ensure equitable access.

Zamani (1997) studied implementation issues in the introduction of computers into the Iranian education system. The results of the study confirmed that the identified implementation issues in using computers in Iranian School were similar to those in other developing countries, e.g. lack of hardware, software and maintenance,
lack of trained people, lack of clarity about the objectives, motivational problems, gender inequity in relation to using computers and the programming language used as well as little educational software that was available in English and was culturally inappropriate.

Baule (1997) studied the technology planning process and the school library media specialists. The finding of the study included the following points:-(a) Staff development for technology was must to be considered by the technology planning team including how to find the time and resources necessary for the success of the programme; (b) Revision of the technology plan was must to be considered when developing a technology plan otherwise the plan would not be able to keep up with changes in the technology; (c) Access to technology for both teachers and students is was the factor in implementation of a technology plan; (d) The development of a support structure for technology was the factor in implementation of a technology plan and ; (e) At a minimum, the technology planning scheme was required to include representation from administration, teaching staff and school library media specialist.

Reeves (1998) studied the principals' perceptions about the adequacy of instructional technology in Georgia Public High Schools. The major findings of the study included that: (a) The average of all schools was 7.56 students per computer; (b) 95 percent of the respondents indicated that they felt that technology was critical in achieving the instructional mission; (c) A little over half of the principals felt that the technology in their schools was adequate and almost two thirds felt that available technology was not being utilized to its fullest potential; (d) Less than 20 percent of the principals indicated that 50 percent or more of their teachers regularly used computers in instruction; (e) Almost one thirds of the principals indicated that none of their teachers used distance learning and ; (f) Urban principals were much less satisfied with the available technology than were rural principals.

Thompson (1998) in a study examined and described the current status of availability and use of the internet among high school vocational education teachers in Idaho and evaluated the concerns these teachers have about using the internet in teaching. A mail survey was administered to a random sample of 438 vocational education teachers throughout the State of Idaho with a 72.8 percent rate of return. Ninety four percent of the schools were reported to had some type of internet access. Only seven percent of the respondents said that they did not know how to use the
internet. Of the teachers, who used the internet, however, most were self taught and only 29 percent had some kind of formal training. Electronic mail was by far the most used application, but as many as 40 percent said that they sometimes used the internet for lesson planning, classroom instruction and personal development.

Schlichting (1999) in a study explored the practices in Illinois School Districts to determine the extent to which Illinois School Districts like organizational goals with their technology investment use and evaluation. Illinois School Districts generally reported that their use of computer technology has not resulted in gain in traditional measures of student performance. Districts indicated that they had not evaluated and applied computer technology as a means to reconfigure the interconnected structural elements within the school organization. Districts responses indicated that they had evaluated and used technology as means to automatic administrative processes that were generally in place.

Technology integration in elementary schools was studied by Espey (1999). It was found that an effective technology plan could lead a district to establishment of a technology infrastructure, including a district-wide network, internet access to all classrooms and high quality staff development. Interviews and observations indicated that teachers integrated the use of two multimedia classroom computers. However, this was not done in a way so as to significantly transform the classroom environment or methods of instructions.

Bradford (1999) studied the factors that influenced experienced teachers in grades kindergarten through five to integrate computer technology in teaching and learning process. The purpose of the study was to determine barriers to integration of computers into teaching and potential teaching strategies to encourage integration. It was found that the teachers reported a significant lack of computer labs, a lack of training and knowledge of how to use software.

Jeffery (1999) carried out a study with the purpose to assess the extent of the use of technology in Secondary Agricultural Education Programmes in the United States. The findings of the study stated that the use of micro computers in the agricultural classroom had significantly increased from 73 percent in 1989 to 98 percent in 1999. APPLE was the dominant system used in 1989 in 64 percent of the programmes and in 1999, the personal computer (MS-DOS) was used in 73 percent of
the programmes. The use of an internet service provider by Agricultural Education Programs had increased 31 percent. The current and anticipated use of technology had increased 50 percent. The Word Processing programme was the software most often used.

Karim (1999) studied faculty's use, knowledge, skills, interests and attitudes about Computer technologies at University Utara Malaysia (UUM) and found that the majority of the faculty members were computer users. They had access to computers in their offices and at home. It was also found that faculty members received their computer training through informal means, self study and other computer uses.

Tiller (1999) in a study examined inequity in computer use by students in schools. It was found that computer use by students was generally low in the schools and most students used computers for lower level computer activities. The student to computer ratio was not significantly different for minority students and non minority students. It was concluded that there were inequities in school computer use.

Basinger (2000) studied the utilization and integration of technology by teachers and found that teachers were moving from "Thinking about how to use" technology to "Using technology to meet their needs".

Capritto (2000) in a comparative study determined the differences in the level, existence, use and integration of technology between California digital high schools and non-digital high schools in Ventura and Santa Barbara countries. It was found that there was no significant difference in the integration and use of technology in the areas of hardware, connectivity, digital content and professional development between California digital high schools and non digital high schools. The first pillar area of priority for digital and non digital high schools was connectivity followed by digital content, hardware and professional development.

Gao (2000) studied the factors, both internal and external ones, that influence university faculty's use of technology in instruction by faculty of the University. It was found that most important factor was the availability of and access to reliable and updated equipment, including both hardware and software, which was identified by 70 percent of the faculty interviewed. The next major factor was the ongoing training on technology use and the technical support available to faculty when they needed it.
Harris (2000) studied the computer use by teachers at Schuraz High School, a Chicago Public School and identified the factors affecting their use. The findings of the study showed that vast majority of teachers used a computer for personal or school use; almost all teachers with 1-10 years of teaching represented the largest group of non computer users; the highest percentage of use for both (Computers and the internet) was for preparing instructional materials, for instructing students in the classrooms and in the interactive labs; the second largest use of computers was for web searching; and few teachers used software other than word processing in their classrooms. The factors that affected use of computers included the direct relation between use of computers and the number of computers in the class-rooms including technology; other educational commitments; and insufficient teacher training, support and follow up.

Hugo (2000) studied the decisions of teachers’ use of technology beyond the barriers of time, training and adequate equipment. The study found that teachers viewed technology merely as a tool to support good instruction and not as a substitute for it. It was found that teachers were willing to integrate new technologies when they believed that these would enhance their teaching or provide a better way of delivering instruction to their students. It was also found that they were willing to use technology and believed that their students should understand technology use in preparation for the future.

Idio (2000) studied teachers’ perceptions about their ability to integrate computer technology into the curriculum and the technology training and technical support they had received. The findings of the study indicated that 90 percent of the teachers perceived that they could operate a computer system; 76 percent could identify and use appropriate instructional software to support the curriculum objectives; 83.33 percent had been regularly modelled how to cite electronic sources for students; 63.33 percent had been trained to use technology in the classroom; and 70 percent had 4 computers per classroom. 96.67 percent of the respondents believed that they could and used e-mail to communicate and shared instructional strategies with colleagues. Only 16.67 percent reported that they used e-mail to communicate with parents. Several of the teachers reported that they needed ongoing technology training and technical support in order to effectively integrate the technology into the curriculum.
King (2000) studied the variables affecting student attitude towards computer use in schools. The findings of the study were that home access to computers, ethnicity and teachers' personal training were significant predictors for perceived usefulness of computers; home access to computers and formal teacher training were significant predictors for expectations of future need for computer skills, and gender was a significant predictor for liking computer work. Significant differences were found across ethnic classification on home access to computers, teacher comfort with computer use, teacher training to use computer, teachers' personal training to use computers and teachers training to integrate computer use into lessons.

Anderson (2001) in a study assessed attitudes of undergraduate microbiology students towards computers and their use of internet resources. The findings of the study suggested that (1) the digital divide with respect to gender and ethnicity was narrowing and; (2) students who were exposed to a course that augmented computer driven courseware with traditional teaching methods appeared to have less anxiety, have a clearer perception of computer usefulness and felt that online resources enhanced their learning.

Anderson (2001) studied trends in use of technology in South Dakota public school districts. The trends showed that smaller schools had more pieces of technology per pupil. The findings indicated trends such as IBM compatible computer being most popular and the schools were equipped with high speed internet access.

Taghavi (2001) in a study compared college students' attitude toward using computers at the beginning and end of the computer literacy course by time of class, gender, age, prior computer experience, access to a home or work computer and collegiate classifications. The findings of the study indicated that time of class, gender and collegiate classification did not significantly influence the overall attitudes of students toward computers. Furthermore, the results of the study revealed that age, prior computer experience and access to a work computer significantly influence overall attitudes of students towards computers. Conclusions and recommendations based on the findings in the study indicated that the computer literacy was found to improve computer attitudes and to help college students develop more positive attitudes toward computer technology.
Whitfield (2001) studied the factors that facilitate and inhibit the implementation of computers into classrooms. The findings of the study were that the teachers perceived four factors as inhibitors as lack of time, lack of appropriate software and hardware, lack of adequate technical support and lack of knowledge.

Technology use in two secondary schools in Botswana was studied by Batane (2002). The findings of the study indicated that computers were learnt as a subject to equip students with basic skills in working with computers. Teachers of various subjects also used computers to retrieve, analyze and present information. The lack of time for training led to limited use of technology by teachers.

Bronson (2002) in a study evaluated the implementation of a Technology Literacy Challenge Grant Project. Results indicated that teachers were making progress in adopting technology instructionally but still needed personal coaching and ongoing support. Participants in the study reported positive results with the students when using the portable keyboards and work processing software especially in the appearance and quality of student writing. Due to their lack of overall instructional proficiency with technology, most teachers were not using their tools to teach the entire writing process from pre writing to final draft. Instead they were using them to publish partially edited student writings. Teachers reported that lack of time for planning, collaboration and familiarizing themselves with the technology tool was a major obstacle.

Davies (2002) in a study assessed and predicted information and communication technology literacy in education undergraduates. The findings of the study revealed that ICT literacy could be positively predicted by: variety of previous computer experience, amount of post secondary computer related studies, amount of ICT exposure in K-12 schooling, ownerships of a home computer, general academic ability, gender (male) and computer self efficacy.

Robertson (2002) studied twenty years of IT (ICT) in UK primary schools and stated that schools inspection reports, at the end of the 20th Century, in both Scottish and English primary schools clearly identified the use of ICT as the weakest aspect of professional practice.
The accessibility, use and training/support of educational technology practices of high schools in a major urban, predominately low socio economic school district was studied by Limon (2003). The study revealed that novice teachers tend to utilize technology more frequently than more experienced teachers. The findings also indicated that computer support and training at the school district was perceived by most teachers as being adequate. In addition, teachers investigated at three high schools perceived that technology use in the district was good; however, 25 percent of the respondents indicated that software support and computer accessibility were less than satisfactory.

Stone (2003) studied the continued barriers to technology integration existing after the digital high school programme in California High Schools. The study found that since lower student to computer ratios within schools did not correlate to increased utilization, a greater emphasis on professional development and technical support was expected to do more to advance the integration process within the schools than additional hardware investments.

An investigation of factors influencing teachers’ use of computer based technology was done by Ellis (2003). The study revealed that most teachers (N=116, 81.7 percent) had access to computer based technology in at least one location. The most commonly reported use of computer based technology included access to information via the internet, word processing and recreational/educational games. The classroom (72 percent) and the computer labs (65 percent) were the most common location of access to computer based technology.

Bates (2003) studied effective teaching with technology in higher education and found that the high cost of technology and vast investments of time meant for successful adoption of ICT by academics is important.

Digital equity in education and state level education technology policies were analyzed by Becker (2003) who indicated that there were inequities in access. Specifically, the students in rural schools or schools with higher percentages of African-American students were likely to have less access to computers.

Ganesh (2003) studied the practices of computer use in elementary education in seven Arizona Elementary Public Schools of a suburban school district. The primary objective was to understand teachers’ practices of computer uses in education
within the context of their classrooms and schools. The secondary objective was to relate those practices in the context of research community’s expectations for educational technology and recommended examples of technology in education. An interpretive compassion of the patterns in these case studies led to the following assertions:

(i) Classroom use of computers was defined by the use of the Accelerated Reader programme and its uncritical acceptance as a software tool to manage students’ reading practice.

(ii) Use of computer technology in schools was similar, ordinary and monotonous.

(iii) Access to use of computers in school for typical student was insignificant in relation to the amount of instruction time at school.

(iv) Use of computer technology in education was symbolic and did not represent curricular integration with technology.

Reynolds, Treharne and Tripp (2003) made an analysis of the reasons for exercising optimism concerning the potential of ICT, to enhance levels of pupil achievement. After a review of evidence concerning the potential of ICT in a small scale survey report showed continuous problems in the adoption of ICT by teachers. It was concluded that more research was needed to improve the expectations and effectiveness of ICT provisions and utilization.

Beninto (2004) in a study aimed at identifying the key to the process of introduction of technology into teaching, outline the current situation, identifying fundamental obstacles to the process and put forward action for improvement of ICTs in Secondary education in the Basque Autonomous Community (BAC) over the period 1994 to 2004. It was observed that the introduction of ICTs in Basque secondary education in the BAC over the period 1994 to 2004 was not as satisfactory as might had been wished. The main obstacles in the process were the following:

(i) The bodies responsible for introducing ICTs in the school acted in an uncoordinated manner.

(ii) The introduction of ICTs was not put forward as a way of resolving complete educational problems, but as a strategic option linked to the ideological impulse of Europe at the time.
(iii) The ICT infrastructure, which was expensive then, rapidly became obsolete and current methodology in secondary education was not the most suitable for working with it.

Eteokleous (2004) studied the computer technology integration in Cyprus elementary schools. The study found that while Cypriot teachers used computers rather extensively for their own purposes, they used them less frequently in their classes. The study also revealed that teachers’ education, school climate, teachers’ professional behaviour and teachers’ attitudes towards the use of computers in education were significant predictors for classroom computer use. The results of the qualitative analysis summarized the factors that influenced teachers in applying computers in their classroom practices. A general uniformity across the three categories of teachers was revealed in terms of the factors that functioned as barriers in applying computers in the classrooms. The factors could be summarized as follows: lack of resources, tyranny of the curriculum, incomplete and inadequate professional development training, lack of guidance, support and incentives from the officials and other factors including technical problems, students, computer literacy level, etc. Along the same lines, a general uniformity across the three categories of Teachers was revealed in terms of factors that facilitated them in applying computers. These factors were summarized as follows: teacher’s computer literacy, teacher’s education beyond bachelor in fields related to computer technology, professional development training organized by the Ministry, teachers’ attitudes about computers and teachers’ instructional philosophies.

Ashmore (2004) in a case study of public elementary school teachers investigated how they believed continuous computer technology support assists the integration of computer technology. The findings of the study indicated that there was a positive correlation between computer usage and technology support. It was also found that teachers, who had continuous support, tend to integrate school technology more. Data indicated no significant difference between teachers’ beliefs about increased use of technology and students’ performance.

Holland (2004) studied the attitudes of gifted and talented elementary school students toward technology and development of technology literacy. The findings of the study were that all students, who were engaged in technology education activities,
demonstrated more positive attitudes and perceptions related to interest in and value of technology as compared to students without these activities.

In a paper presented by Islam (2004) at International Conference, organised by World Bank Organization, titled “Opportunities and Challenges: Education and ICT”, it had been stated that the lack of equipment, infrastructure, production of quality electronic learning material and of the delivery of such material was hindering the possibility of ICT in education. Moreover, most of the Bangladesh’s efforts so far to embrace ICT in education had only accelerated the widening of a digital divide between wealthy and poor schools and institutions. ICT as introduced had not yet become a catalyst for important change in Bangladesh’s education.

Edwards and Mary (2004) studied the educator’s perceptions and implementation of State, District, and School-level standards for instructional technology in an urban high school in New Jersey. The study found that:

(i) Although the administrators indicated that they were familiar with technology standard at the state, district or school levels, the majority of the teacher participants were not familiar with these standards.

(ii) Lack of computers, lack of sufficient time and lack of good instructional software were obstacles encountered by teachers that prevented them from using computers in the classroom to enhance instruction and learning.

(iii) Some teachers indicated that they were using technology as a tool in the classroom that allowed students to do research via the internet and to produce reports and projects.

Al-Alwani (2005) studied the barriers to integrating Information Technology in Saudi Arabia Science Education. The study examined current level of information technology integration in science education in the Yaman school district in Saudi Arabia and barrier to use. Science teachers rated barriers limiting use of technology in teaching with a scale ranging from 0 (does not limit) to 3 (Greatest limits). Results found that in the use of technology in teaching Science, all four factors were sufficient barriers: infrastructure and resources, Policy, Support and science teachers personal beliefs regarding technology. Regression analysis found that location, level of training, teaching experience and gender predicted frequency of use of technology in teaching Science. Teachers who received in-service training programs used IT
significantly more frequently than those who did not receive any training. Teachers who received both pre-service and in-service training used IT significantly more frequently than those who did not receive any training. Low technology users perceived that there was no support or incentives for using technology. High technology users had positive personal beliefs about how information technology benefits learning, while low technology users held negative beliefs about technology use. The more barriers science teachers experienced, the less likely they were to be Information Technology users. There was a need for more computers in schools, more teachers training, more time for Teachers to learn to use technologies and more readily available technical support staff.

Ferguson (2005) assessed the effect of technological infrastructure, behaviours and attitudes on rural Appalachian health care providers. It was found that workplace computer access was common, 59.6 percent had sole access and 40.2 percent shared access Internet access was 82.7 percent broadband, 13.5 percent dial up and 2.4 percent no access. Although rural providers were more likely than urban to have slower dial up access, they regularly used the internet. Over 75 percent of providers accessed the Internet at home for work; 34 percent reported dial up and 66 percent had broadband connection. Although 50 percent used the internet for continuing education in 2004, still most preferred in person workshops or print based modes of continuing education, 58.9 percent e-mailed daily and 80 percent accessed medical information via the internet regularly.

Foy (2005) studied the computer ownership and school and home use of computer technology of the students of Alliance High school. The findings of the study included: (a) the relationship between having a computer in home and ethnicity was found to be statistically significant; (b) The relationship between having Internet in the home and ethnicity, income, gender and grade was significant; (c) The relationship between using computers at home for word process and ethnicity, income, gender and grade was significant; (d) The relationship between use of computers at home for internet search was significant between gender and grade in school; (e) the relationship between use of computers to do drill and practice and grade practice and grade in school showed significant difference; (f) the relationship between use of computers at home to e-mail and grade in school showed significant difference; (g) Teachers assigned homework that required students to use computers
more than they assigned in class work that required students to use computers; (h) word processing was the use for which students were most asked to use computer by teachers; (i) students were almost never or not at all asked to use drill and practice, to do research on the Internet or use e-mail to complete home work or in class work by the majority of teachers and; (j) most students use drill and practice very little.

Honey (2005) studied computer lab usage by rural elementary classroom teachers. The findings of the study were that there was a significant relationship between instructional competency and computer application competency and the number of minutes spent in the computer lab. The more confident teachers felt about his/her computer instruction and application skills, the more minutes he /she spent in the computer lab training and institutional support was not related to the number of minutes a teacher spent in the lab. Teachers, who had the support of technology, spent significantly more time in the lab. In addition, there were significant differences between teachers who went to the lab and those who did not go at all in their levels of perceived competence in instruction and computer application skills. Those who did not go to the lab, felt less competent, instructionally and technologically, and less well trained. Open ended responses revealed some of the same concerns in terms of technological competency along with time availability of lab, training and institutional support were the issues that were mentioned. Training issues included a need for more training (hardware and software trouble shooting and teaching computer dependent lessons), competency (managing a diverse group of students, maintaining a lab class room, providing individual instruction in a lab situation, whole class instruction in a lab, and managing (hardware and software problems) and institutional support (training opportunities, help in lab, functioning hardware and software, and money for updated hardware and software). The 21 respondents that gave positive responses to computer lab usage mentioned that they were well trained/very comfortable in the lab; had a computer assistant in the lab; had a good experience in the lab; felt that the lab was of high importance or used classroom or other computers.

McAdoo (2005) assessed a teacher laptop program in a south western urban school district and found that the teachers were currently integrating technology at the very lowest levels in the district. Teachers also expressed what barriers and support systems they felt were available to assist them in integrating technology.
Robinson (2005) descriptively studied computer usage in a school and its effect on bridging the digital divide and found that schools can play a major role in narrowing the digital divide, but one of the critical factors that must be in place for this to happen was equal access to technology and the internet by all students. The purpose of the study was to examine and to explore students access to and use of technology and the role schools could play in bridging the digital divide. The conclusions were:

(i) All students at this school, regardless of ethnicity, participated in the direct use of computer and the internet at school.

(ii) All students displayed similar patterns in computer usage at home, school, community centres and libraries.

(iii) Significant data were provided to support that internet access and computer access was available to all students at this school but the same level of access was not available in the home.

(iv) Much less of a disparity was present when comparing these students access to computers at this school and at home than that provided through national reports.

(v) This school had a ratio of one computer for every student thereby provided an extra ordinarily ability to have all students participate in the use of technology.

(vi) Overall, most of the students displayed similar distributions of software usage at school across all ethnicities.

(vii) Students expressed that their parents had selected this school because of the opportunity to utilize technology regularly at school.

Tekyi-Annan (2005) critically studied students’ computer use by students in high school. The findings suggested that there were more students than computers in the courses, and that as many females as males had their own computers. Students spent, on an average, five hours a day on their home computers for both academic and non academic pursuits and between 60 percent and 70 percent of the time was for non-academic purposes. Students used their computers to pass time and to cure boredom, by seeking information, playing games and receiving and sending e-mail.
British Educational Communications and Technology Agency (2005) studied the impact of Broadband in Schools and found that as on June 2005, 81 percent of maintained schools in England had a broadband connection.

Green (2006) studied the impact of teacher self-efficacy and attitudes toward classroom computers on the use of classroom technology. The findings of the study revealed that the teachers indicated that they used computers for a variety of classroom tasks (e.g., lesson planning, drill and practice, grading, education, classroom management and presentations) and were familiar with several types of productivity software (word processing, grade books, educational games, presentations etc). It was found that teachers who recognized the value of computer use in their classroom were likely to have higher levels of teacher efficacy.

Johnson (2006) investigated the effects of framework for integrating technology (In-Tech) training programme on teachers’ computer self-efficacy, technology integration, current instructional practices, personal computer use and factors relating to use or non-use of computers in the curriculum. The results indicated that the variables teacher’s perception of the quality of the In-Tech training and personal computer use contributed significantly to teachers’ computer self-efficacy (CSE), however, variable current instructional practice was not statistically significant. It was found that there were statistically significant differences in the level of contributions to the CSE by the independent variables. There was a relationship between facts relating to use and non-use of computers in the classroom and teachers’ CSE.

Persaud (2006) studied the school administrators’ perspective on their leadership role in technology integration. The findings in the study revealed that administrators were proficient in technology for data management and analysis and for administrative purposes. However, they were deficient in areas of instructional technology. It was also revealed that administrators needed professional development on all standards of “National Educational Technology Standards for Administrators”.

Tondeur, Keer, Braak and Valcke (2007) studied ICT integration in the classroom. It was found that three significant determinants of ICT class use were subject to the influence of school policies namely the number of Teachers attending in
service training, the availability of internal ICT support in school and the pupil/PC ratio at school. The findings suggested that successful ICT integration was clearly related to action taken at school level such as the development of an ICT plan, ICT support and ICT training.

Elena (2008) in United Nation (UNESCO) Bangkok report “Strategy Framework for Promoting ICT Literacy in Asia Pacific Region Bangkok” stated that there was roughly a 1:1 student to computer ratio in Japanese elementary and high schools. In Japan, there was: (i) No digital divide in ICT infrastructure and in access; (ii) High percentage of school had internet connection; (iii) High percentage of teachers could operate computers. In Laos People Democratic Republic, almost no public or primary, elementary and secondary schools has access to the internet. Moreover although Afghanistan has an established educational radio and television service, a computer based work in classroom is still limited. The Government of Republic of Maldives, on the other hand, emphasised appreciation for the potential benefits of ICT in the country. Hence, ICT policies in various sectors had been formulated but very little has been actualized, specifically in education. While there were computers in schools, those resources were mainly used for limited office automation and not for general student use. Thus ICT use was in its infancy due to high cost of technology, uneven access to ICT facilities and limited connectivity. In Malaysia, 75 percent to 90 percent of all schools and 100 percent universities had access to the internet and a number of schools had their own websites. All teachers were required by the government to take basic informatics course. In Republic of Korea, ICT was a required subject in elementary schools and electronics a required subject in high schools. Training for teachers was provided to enhance and update ICT teaching methods and the curriculum for ICT use in elementary and high schools had been revamped. In Thailand, 20 percent of the teachers and personnel for both primary and secondary levels had been trained to develop ICT literacy (e.g. MS Office, Visual Basic, MS Access etc.)

Report on ICT in Primary and Post Primary Education in Ireland about ICT infrastructure census in schools by Inspectorate Department of Science and Education, Ireland (2008) stated that the student computer ratio (SCR) in Irish schools was 9.1:1 at primary level and 7:1 at post primary level. Infrastructure available from Organisation for Economic Co-operation and Development (OECD) suggested that
countries had taken the lead in the provision of ICT in schools and were aiming at or achieved a student computer ratio of 5:1. The lack of technical support and maintenance was a significant impediment to the development of ICT in Schools. At primary level, computer rooms were generally a feature of the larger schools. However, access by students to computers was found to be superior where the computers were located in the classrooms. At the post primary level, there was a greater permeation of computers in specialist classrooms than in general classrooms. Schools were found to use a limited range of ICT infrastructure, mainly printers and digital cameras. Digital projectors were found in post primary schools. At Primary level, interactive white boards were present in a small number of schools. Schools that made dedicated computer facilities available to teachers reported that it had led to the use of more high quality and creative teaching resources in classroom.

Mbangwana (2008) studied ICT introduction in schools and classrooms in Cameroon. It was found that computers were kept in a computer laboratory commonly called the multimedia centre, with upto 75 computers connected to the internet. These computers were often networked to printers and scanners. Teachers as well as students had daily access to the centre. Access by student to e-mail depended on their socio cultural context and parental beliefs about the impact of access on moral development. Such belief seemed to be influenced by availability of a computer and internet at home. Teachers’ access to ICT also varied widely. The ICT user to computer ratio ranged from 35 to 77 users per computer.

Dangani and Mohammed (2009) studied Information and Communication Technology literacy among academics in Ahmadu Bello University in Zaria. It was found that the computer system, CD ROM, flash drives, printer, scanner and mobile phones were most available ICT facilities in Abu Zaria. The research concluded that ICT literacy was necessary in the scheme of things in the 21st century. It was finally recommended to had provision of the ‘state of the art’ ICT facilities in all faculties and staff offices in the universities.

Tandon (2011) in the article “Punjab Tops in School Infrastructure: India’s in Education Development Index and Rank (Composite Primary and Upper Primary) in “The Tribunes” stated that there were 1.3 million recognized primary and upper Primary schools. In the age of IT, only 16 percent of the schools had computer
facilities. It also stated that the highest percentage of computer facilities was in Chandigarh (90 percent schools) and in Delhi (82 percent schools).

Ayere, Odera and Agak (2010) studied e-learning in secondary schools in Kenya and found that non-NEPAD schools had better ICT qualified Head of Departments (HODs) than those from New Partnership for Africa’s Development (NEPAD) schools. This was because 67 percent of Heads of Departments from the NEPAD schools were holder of certificate in ICT acquired after two weeks of in-service training as compared to 17 percent in the non NEPAD schools having a certificate after two years of training while the rest 83 percent had either a diploma or degree in computer studies. The qualification of the ICT teacher varied in each school such that the NEPAD schools had teacher with certificate (33 percent), diploma (17 percent) and degree (50 percent). The non NEPAD schools had teacher with certificate (11 percent), diploma (56 percent) and degree (33 percent). The response of student indicated that more than half were never taught mathematics, languages and humanities using any electronic media, even though more than half of them were taught science using ICT. Approximately 50 percent of the students experienced ICT related learning on a weekly basis in all subject areas, with science being indicated by 100 percent of the students. NEPAD schools had more superior ICT equipments suitable for use when teaching, especially the presence of e-content through the internet and e-libraries. All the NEPAD schools had LCD projectors with half of them having Smart boards, which none of the non-NEPAD schools had. The study established that overall a reasonable number (53 percent) of the students used internet services in their schools.

Ofsted (2011) conducted a survey to evaluate information and communication technology education in schools 2008-2011 in England and Wales. This report consisted of Part A and Part B. Part A reported on the quality of the provision of ICT in primary and secondary schools and its impact on achievement and standards. Part B explored seven issues arising from the survey evidence which focused on the impact of the use of assessment on pupils’ achievement and future success, the curriculum and qualification, professional development of staff, e-safety, use of virtual learning environment, availability of ICT resources and securing best values. Findings indicated that (a) The teaching of ICT was good or outstanding in nearly two-thirds of the primary schools visited. The position was less positive for ICT in secondary
schools, with just under half of the schools surveyed judged good or outstanding; (b) The use of assessment was a considerable weakness in both the primary and secondary schools visited; (c) In majority of the primary schools, there were regular audits of staff professional development needs. The approach was less systematic in secondary schools, where inspectors saw very few examples of any evaluation of the impact of training on the effectiveness of teaching on pupils' learning; (d) All the schools visited ensured that pupils were well informed about safe use of the internet and were able to use it in a responsible and safe way in schools.

SMART(2011) conducted a large scale survey of ICT in schools of Europe. The study found that in Europe, at all class levels, there were between 14 and 31 computers (desktop, laptop/tablets, connected or not connected to the internet). Of these computers, all were internet connected PC per 100 students at all levels. In the Europe, there were 5 to 12 students per online desk computer, eight per 100 students at grade 4, 13 at grade 8, 14 at grade 11 general and 21 for every 100 grade 11 vocational students. The older the student, the more online computers were available. Over 9 out of 10 students in schools of Europe were with broadband.

Adetimirin (2012) studied ICT literacy among undergraduates in Nigerian Universities and found that computer, telephone and the internet were the three ICTs mostly used by the undergraduates although more on an occasional basis. The undergraduates in the State universities were found to have poor ICT literacy skills in the use of three ICTs while those in the Federal universities, were with average ICT literacy skills. Three major factors affecting the ICT literacy of the undergraduates were identified as irregular power supply, inadequate ICT and limited duration of the use of ICT by the university administrators.

Barker (2012) in magazine article “A Return to ICT investment” written by British Educational Suppliers Association (BESA) studies showed that there was unlikely to be a continued focus on interactive white boards as 85 percent of primary schools and 73 percent secondary schools stated that those had “good provision” of hardware in this area. The study indicated that (a) There was increase in demand for laptop computer with one-thirds of schools identified laptops as a requirement; (b) The need for training in the use of learning platforms was high in primary schools, with 70 percent of schools indicating that more than half of their teachers required training; (c) The BESA research also showed that schools were using more digital
contents and implementing more mobile solutions to meet the challenges of young people in the digital age.

Revised Scheme of Information and Communication Technology (ICT) in schools will be carried out in six states of India including Punjab as per instructions of Department of School Education and Literacy, Ministry of Human Resource Department (MHRD), India dated 25th October 2012 under the title "Education/Impact Assessment of ICT @ school scheme". The core objectives of the evaluation are to assess the- (a) Relevance of the project; (b) Benefits derived from the project; (c) Whether benefits would continue after the project ends (sustainability); (d) The attainment of specific targets for key indicators (effectiveness) and; (e) The amount of effort and resource used and institutional development and sustainability.


Studies have been conducted by Mahajan (1994), Shah and Agarwal (1994) and Joshi and Mahapatra (1995) on computer Assisted Instruction (CAI). Studies on comparison of ICT plans have been conducted by Pusiri (1992), Capritto (2000), and Ayere, Odera, Agak (2010).

The researches already conducted focussed on implementation of ICT Education Project, Studies on factors/elements for computer literacy/education including infrastructure, access and use of ICT, infrastructure related to ICT, teacher training related to ICT, computer assisted instruction and comparison of ICT plans. However, the researcher could not come across many studies which focused on evaluation of ICT in the schools of India and specifically that of Punjab State. The study by monitoring institutes as per instructions of Department of School Education and Literacy, Ministry of Human Resource and Development (MHRD) was still to be undertaken in the state. In view of this, it was thought worthwhile to undertake the present problem for the investigation.