CHAPTER-I
INTRODUCTION

1.1. Introduction

It is relevant to note that the globalization and technological change have created a new global economy “powered by technology, fueled by information and driven by knowledge. The emergence of this new global economy has serious implications for the nature and purpose of educational institutions. As the half-life of information continues to shrink and access to information continues to grow exponentially, schools cannot remain mere venues for the transmission of a prescribed set of information from teacher to student over a fixed period of time. Rather, schools must promote “learning to learn,” i.e., the acquisition of knowledge and skills that make possible continuous learning over the lifetime. Concerns over educational relevance and quality coexist with the imperative of expanding educational opportunities to those who made most vulnerable by globalization developing countries in general; low-income groups, girls and women, and less-skilled workers in particular. Global changes also put pressure on all groups to constantly acquire and apply new skills. The International Labour Organization (ILO) defines the requirements for education and training in the new global economy simply as “Basic Education for All”, “Core Work Skills for All” and “Lifelong Learning for All”.

Information and Communication Technologies (ICTs) which include radio and television, as well as newer digital technologies such as computers and the internet have been touted as potentially powerful enabling tools for educational change and reform. When used appropriately, different ICTs are said to help expand access to education, strengthen the relevance of education to the increasingly digital workplace, and raise educational quality by, among others, helping make teaching and learning into an engaging, active process connected to real life. However, the experience of introducing different ICTs in the classroom and other educational settings all over the world over the past several decades suggests that the full realization of the potential educational benefits of ICTs is not automatic. The effective integration of ICTs into the educational system is a
complex, multifaceted process that involves not only technology indeed, given enough initial capital, getting the technology is the easiest part, but also curriculum and pedagogy, institutional readiness, teacher competencies, and long-term financing among others.

This primer is intended to help policymakers in developing countries define a framework for the appropriate and effective use of ICTs in their educational systems by first providing a brief overview of the potential benefits of ICT use in education and the ways by which different ICTs have been used in education thus far. Second, it addresses the four broad issues in the use of ICTs in education effectiveness, cost, equity, and sustainability. The primer concludes with a discussion of five key challenges that policymakers in developing countries must reckon with when making decisions about the integration of ICTs in education, namely, educational policy and planning, infrastructure, capacity building, language and content, and financing.

**Information and Communication Technology**

The end of the 20th century witnessed very exciting changes, one of them being in the field of Information and Communication Technology. All concerned with education must realize that in the fast changing world of today, the students have to be prepared to cope up intelligently with the social, economic and technological changes. The educational environment is changing rapidly as a consequence of ICT and will continue to change. Information and Communication Technologies are electronic and computerized devices and associated human interactive materials that enable the user to employ them for a wide range of teaching and learning processes in addition to personal use around the world, educational systems are under increasing pressure to use the new Information and Communication Technologies to teach students the knowledge and skills they need in the 21st century with the emerging new technologies the teaching profession is evolving from an emphasis on teacher centered, lecture based, interactive learning environments. (Vandana Mehra and Dilli Raj Newa, 2009)

Knowledge of Information and Communication Technology and use of ICT skills in teaching and learning have become imperative for today’s teacher.
The attitude of teachers has been found to be a major predictor of implementing new technologies in instructional setting and the teacher remains a key component in integration of technology in educational settings. Computers are revolutionizing all fields of activity now-a-days. With quest knowledge growing at a very rapid pace and with the human intellect becoming more and more inquisitive, the need for data ware housing, data analysis, decision making and presentation has become the most pointed aspect of modern living. Right from the scientist and technologist down to the common man, everybody has experienced the touch of a machine through local area networks, wide area networks and the internet, which access and present information. The network revolution owes itself to the economics of having different computers, being able to talk to each other meaningfully. This has also been driven by the technologies of cable and satellite based transmission. Now-a-days computers are linked up locally forming Local Area Network (LAN).

In the last fifteen years computers sparked many changes in this area. From pre-school children to senior citizens, all use the computer for their intellectual benefits, right from the maintenance of personal data. There are many places today where computers are found in classrooms and libraries. The progress may be a little bit slow in India due to economic constraints.

In the classroom students use computers to develop science projects, prepare reports and gather information from electronic source around the world. An intelligent student can vertically dive himself into the ocean of knowledge and examine deep to the extent that a teacher cannot always afford with human limitations. Schools are perhaps the most needy destinations for multimedia. Multimedia will provoke radical changes in the teaching system because it is a bamboo combination of the text, graphic art, sound, animation, and video elements. The multimedia, to meet the needs of several users, requires large amounts of digital memory. Intelligent students find that multimedia goes beyond the traditional methods of teaching. A teacher becomes more like a guide and mentors along the learning path. The students become the core of learning process, as they are the objects of creative learning.
e-Learning in India

The rapid development of Information and Communication Technologies during the past two decades has head many points of contact with education and training. The development of technology is placing new demands on expertise and also leading to the increasing use of information technology in teaching and learning. Wireless connectivity, notebooks their design and use, a transition from e-learning to media learning is one of the challenges being faced by educational institutions. The world is going through a phase of globalization and the success of an organization depends on how quickly its workers are able to learn and transmit various skills required today. United States (US) and Europe have already adapted to e-learning to a large extent. In fact there is a widespread recognition that the digital divide is a significant problem between the developed and developing countries.

India is currently the fourth largest economy in the world that is attracting global demand for its information technology and software services. However India suffers from telecommunication infrastructure bottlenecks like lack of bandwidth, low lease based lines, high cost of software and slow servicing, which create hurdles in the growth of information technology in India. Although e-learning is being used in the corporate sector in India for providing in-service training yet we have a long way to go. Gurukul online is the first educational portal for information technology industry in India. e-learning portals like Zed University. NIITs netvarisity and aptechs online varsity also came to the fore about a few years ago. Institutions like Indira Gandhi National Open University (IGNOU) are doing well in this field. In fact a major e-learning initiative in this direction is the sheplhakarma project that provides the schools with the essential five Cs: computers, content, connectivity, coaching and models of commercial sustainability. e-Learning is still new in India and needs to pick up if education is to have far reaching implications. Distance education has always been considered inferior to traditional education in India. This requires a cultural shift. We have to educate the people about the power of e-learning. Online learning could also help bridge the gap between distance education and formal education.
Importance of e-Learning

Faster Learning

With e-learning students will learn up to twice as much in half the time that they would in classroom teaching. This is because the course progresses as fast as the student can without worry for other student or an instruction.

Consistent Instruction

Every instructor has his or her own style, which may not be best for student learning. Some days the instructor is in top form and delivers a great class. Other days he or she may be bored, tired or simply unmotivated. With e-learning the course is software driven and each student receives the same high quality content.

Higher levels of Retention

Well-designed e-learning can increase retention over instructor led training.

Greater levels of Assessment

With an e-learning solution student activity can be tracked down to the finest level. Every student response to quizzes, simulations and exams can be tracked and fed into customizable reports.

No travel Expenses

With web based training there is no need to coordinate hundreds of different and conflicting schedules and no need to pay for student travel to a training site.

No need of Classroom

In e-learning there are no actual classrooms, no teachers or textbooks, but it gives the impression of studying in a classroom.

Incredible saving of Time and Money

e-learning means no travel, no schedule conflicts, no equipment issues, consistent instruction, higher retention and less money than instructor-led training.

Types of e-learning

These are a few of the most common types of e-learning.

Technology –Based Learning (TBL)

The phrase, interchangeable with e- learning technology based learning includes deployment of methods that use recent technological development such as computer-mediated communication, video-conferencing, multimedia, groupware,
video on demand, desktop publishing, intelligent tutoring system, virtual reality just to name a few.

**Web Based Training (WBT)**

Generally web based learning, e-learning uses streaming media, text, and graphics to develop exciting learning environment that is deployed right on the user via the internet. It’s a great way to e-learning for the large group of people scattered across the globe, but it can present the same deployment challenge that the audience encounters in dial up connection. (Rachna Rathore, 2007)

**Education for the Emerging Information Society**

The global education problem cannot be solved by conventional means like building classrooms and training large number of teachers. The keywords in the educational system of the future are production of knowledge, geographical and temporal independence, pedagogic and structural innovation. Building a new society heavily relies on the introduction of ICTs in education. Presently, there are tremendous efforts on behalf of most governments to modernize their countries educational systems on the basis of ICTs perceived as a key to such modernization. Some countries consider ICT a vital component in upgrading the quality of education through changes in curriculum, mastering of new training skills and wider scope of knowledge. In other countries ICTs are utilized mainly to ease access to education for various groups of population are used for the narrower purpose of facilitating self-education through programmes broadcasted via radio and television. Yet some countries emphasize the reliance on technologies as means to transform the educational environment or satisfy specific needs of different categories of students.

The issues of teaching and learning are of central importance to the evolving information society. The development of modern ICTs is creating an environment of rapid ongoing changes. This environment requires a fundamentally new approach for education. A human being demands new skills and understanding on the ongoing basis. In other words, humanity must embrace and promote a culture
of lifelong learning. ICTs exceed the traditional framework of the education process. Learning can no longer be viewed as a ritual that one engages in during the early part of a human being's life only. ICTs are being used to cross age, time and space barriers to bring lifelong learning to all. People of all ages whatever they are doing, in all places and in all different environmental contexts are learning all the time. Thus, they constitute the learning society. (Vladimir Kinelev, et.al 2004)

The amazing standards and prospects of applications offered by ICTs in learning and teaching show that humanity is on the threshold of new stage of the educational revolution which will entail a dramatic shift in all spheres of human existence. These circumstances and new social demands, the new world community shaped by the new ICTs and models of action, call for new literacy for the information society. Provision of this new literacy implies the creation of new technology for obtaining scientific knowledge, new pedagogical approaches for teaching and learning, new school curriculum and methodological materials for teachers and learners. This is to awaken student’s intellect, shape an individual’s creative potential and mentality, and develop holistic world outlook in an individual to let him or her gain a foothold in the information society.

**ICTs in Secondary Education**

Teacher should play a key role as facilitator in the learning process. Teacher training is crucial for laying a road map toward “learning schools” via “learning teachers”. ICTs are a sympathetic mode to mobilize teacher’s creativeness and make their didactic practice more flexible and ingenious. The dominant paradigm so far is that teachers need to be taught likewise they are supposed to teach later on. The dilemma of bringing teachers to a new didactic method like the integration of ICTs comes from the fact that teachers themselves were taught in traditional ways for many years to date back.

The road map towards “learning schools” runs via “learning teachers”. ICTs are a sympathetic mode to mobilize teacher’s creativeness and make their didactic practice more flexible and ingenious. Intensified teacher desire to use ICTs in the
learning process nowadays is sustained by the fact that alternative methods of assessment are being developed to decide whether to permit teachers to work on the basis of their expected classroom performance. E-communities become quick and popular ways to discuss staff perfection and teacher training. Alongside with the role of ICTs as a learning tool, their potential role for the teaching process came into focus. It is remarkable that so far the ICT support for teacher has not been focused on the didactic integration of cognitive learning tools, more interest has been paid to www-based learning management systems, its main asset is the internet based functionality to deliver the “just – for –you” content “just- in time” and to promote correspondence between the learners. The main role of ICTs is to act as a catalyst for the learner’s interest to get acquainted with the unknown. Even if the content is understood it is not obvious what to learn and why it is important to learn. At the core of curiosity is one's existential awareness what do I see as crucial for me and what tools are critical in this process. It means that the ICT is a bridge between existential and intellectual aspirations. As soon as learners perceive the need to learn to improve living conditions, it becomes difficult to prevent them from learning.

ICTs as a facility for teaching and learning had gone through various stages before it arrived in its catalytic function now-a-days.

- The early software prototypes that demonstrated the computer as an electronic teacher stems from the early seventies. The attempt was to program a dialogue between an expert and novice. The expert role was to explain and correct mistakes of the learner.
- Since more complex structures were introduced, the computer took the role of representing the knowledge domain. Expert systems were established in the early eighties. The key problem was to make human thinking explicit. The so called fifth generation of thinking machines failed except smaller attempts in practical reasoning.
• Intelligent tutoring, simulation and embedded task support systems were built in the early nineties. The attempt created large expectations for the instructional and curriculum designers.

• ICTs are no longer the instructional format for reconciling prerequisite learning steps. Now they offer an exploratory space where the learner is in charge of his own education. The teacher here is just a facilitator who stimulates the learner to take risk, understand by analogy, reflect and offer consolation. Video conferencing, broadband connection in combination with virtual reality allows the learner to exist in foreign environments, swim and float through micro and macro cosmos.

**ICTs and Quality of Education**

In education, we should proceed from understanding that not only they facilitate educational opportunities but also assist an individual in perfecting his perceptions, as well. Modern ICTs provide learners with richer information objects such as images, videos, complex structures of knowledge and their combinations available via the internet or other intelligent computer networks. ICTs radically extend possibilities for visualization, including visualization of the invisible, visualization in changed colour and shapes. Colorful images of architecture, sculpture or painting, grouped thematically and accompanied by well written texts and beautiful music have a strong emotional effect on the student to develop his or her artistic taste and at the same time enable the student to learn more about culture, art and nature.

At the same time we should take into account that parallel to education as a means of preparing students to life, cyberspace as another educational milieu is also developing. The seminal works of Vygotsky, Piaget and Bruner gave rise to the term exteriorization of physical objects which suggests our creating “psychic” equivalents of the latter as conceptual models to be further used to construct variants of our own internal reality or virtual realities. Cyberspace prompts a reverse process, which could be called exteriorization models of the physical world constructed in the human mind are let out into cyberspace. So we should proceed
from the understanding that it is necessary to develop in an individual a particular perception of his or her habitation, which comprises objects of the physical world and the ideas of these objects in the human mind as well as the system of ideas in information space. Thus ICTs do not merely enhance intellect they designate new dimensions of the human mind, produce an orderly system of a new global culture and also open up vast and exciting perspectives of their use in improving quality of education. In spite of massive technologies progresses, the practices of education have remained almost unchanged for the last two centuries. Inspired by the machine paradigm of the industrial society, education was viewed as an industrialized way of delivering knowledge. Now, as learning and education extend into cyberspace, and the rise of the knowledge society is announced, we seem to be unable to break away from those traditional practices into the practices that have value community, interaction, context, organic processes, complexity, change, and many other attributes that radically distinguish our era from that of our industrialize ancestors.

Global economic competition has brought to the fore the critical importance of quality of human resources, and the demand for new competencies in today’s information society. It is a need that is likely to be articulated in the country with a well developed educational system in the industrialized world, as well as in a developing country that has not reached the goal of universal primary education yet.

Strategies for introduction of substantial educational changes and improving quality have been a concern of educational policy makers for many years. Concern of education quality has progressively shifted its focus from input to outcomes in terms of learning achievements. The educational system, schools and individual students are under increasing pressure to reform. In considering these reforms and proposals to implement them, education policy makers, planners and managers face two major decisions. The first one is should resources be invested in ICT activities or would better results be achieved if resources were invested in some other aspect of education system such as school buildings, textbooks, teacher training or number of teachers? Given the contemporary worldwide emphasis on
ICTs it is unlikely that it will be dismissed as an area that does not merit further consideration and investment. In this case the next question arises, what kind of ICTs and what usage and in what conditions is likely to impact the quality of education in schools? It could be possible to get an answer to this question after reaching the quality of education definition which further requires the choice of particular aspect of education that will be the focus of attention. Since education has many purposes components, and competences, questions regarding quality may reasonable and arise concerning any important aspect of a system, infrastructure, school buildings, administration, teacher training, education materials, teaching, or student achievements. These elements are interrelated, and serious, deficit in one is likely to have implications for the quality of others. Policy makers traditionally will be privileged a linear and sequential approach while evaluations based on the lessons from the past suggest that it is a multifaceted challenge.

Improving the quality of education and training is a critical issue, particularly at a time of educational expansion. ICTs can enhance the quality of education in several ways: by increasing learner motivation and engagement, by facilitating the acquisition of basic skills, and by enhancing teacher training. ICTs are also transformational tools which, when used appropriately, can promote the shift to a learner-centered environment.

**Active Learning**

ICT-enhanced learning mobilizes tools for examination, calculation and analysis of information, thus providing a platform for student inquiry, analysis and construction of new information. Learners therefore learn as they do and, whenever appropriate, work on real-life problems in-depth, making learning less abstract and more relevant to the learner’s life situation. In this way, and in contrast to memorization-based or learning, ICT-enhanced learning promotes increased learner engagement. ICT-enhanced learning is also “just-in-time” learning as told earlier in which learners can choose what to learn and when they need to learn it.
Collaborative Learning

ICT-supported learning encourages interaction and cooperation among students, teachers, and experts regardless of where they are. Apart from modeling real-world interactions, ICT-supported learning provides learners the opportunity to work with people from different cultures, thereby helping to enhance learners’ teaming and communicative skills as well as their global awareness. It models learning done throughout the learner’s lifetime by expanding the learning space to include not just peers but also mentors and experts from different fields.

Creative Learning

ICT-supported learning promotes the manipulation of existing information and the creation of real-world products rather than the regurgitation of received information.

Integrative Learning

ICT-enhanced learning promotes a thematic, integrative approach to teaching and learning. This approach eliminates the artificial separation between the different disciplines and between theory and practice that characterizes the traditional classroom approach.

Evaluative Learning

ICT-enhanced learning is student-directed and diagnostic. Unlike static, text- or print-based educational technologies, ICT-enhanced learning recognizes that there are many different learning pathways and many different articulations of knowledge. ICTs allow learners to explore and discover rather than merely listen and remember.

Integration of ICT in Teaching Learning

21ST Century is the age of Information and Communication Technology. All over the globe, there is a trend to use ICT in the teaching learning process. The teacher and learner must gain access to technology for improving learning outcomes. Educational reform includes successful designing and implementation of ICT in the teaching learning process, which is the key to success. There is a rapid shift of educational technologies and political force, so as to shape the structure of the system of education across the globe. Efforts must be made by the
educationists to change the process of teaching learning in order to prepare the students to adjust themselves to the society which is rich in information and technology. Information and Communication Technology is an important instrument which can transfer the present isolated, teacher centered, book centered learning environment into a rich student centered environment. This new learning environment developed by the ICT is called interactive learning environment. ICT is a new paradigm of the teaching learning process; we must accept the new technology and use of ICT as a tool of teaching learning process. ICT aims at transferring the old traditional paradigm of learning to the new paradigm of learning. (Manoj Kumar Dash, 2007)

Basing on the use of ICT learning is neutral, social, active linear or non linear, integrative and contextualized, based on ability and strength of the student. Hence, use of ICT in the teaching learning environment can bring a rapid change in the society. It has the potential to transform the nature of education, where and how learning takes place and the role of learners and the teacher in the process of learning. It is essential that teachers must have basic ICT skills and competencies. It is for the teacher to determine how ICT can be best used in the context of culture, needs and economic conditions. Educational institutions need to develop the strategies, plan to improve the teaching learning process and ensure that all teachers are well prepared to use the new tools for learning. The emergence of the knowledge based society is changing the global status of education. It is the time to develop a new knowledge base global society. There are a few but important reasons for integrating technology that we have come to understand in our efforts to integrate technology: 1) correctly designed, more depth into the content-area curriculum is possible, 2) in the information age, there is an intrinsic need to learn technology, 3) students are motivated by technology, thus increasing academic engagement time, 4) while working in more depth with the content, students are able to move beyond knowledge and comprehension for application and analysis of information, 5) students learn where to find information in an informative rich world, 6) computer skills should not be taught in isolation and 7) students develop
computer literacy by applying various computer skills as part of the learning process.

**Challenges of ICT**

It is essential to integrate ICT in curriculum of teacher education so as to prepare teachers for the future.

**Knowledge and skills needed to use ICT effectively**

The teacher educators must and should have sufficient knowledge and skills to use ICT in delivering a lesson. They need to develop their transactional strategies so as to meet the need and demand of the learner. It demands professional development of the teacher educator. ICT professional development includes:

- transactional strategies
- access to technology
- time and support
- ongoing development
- training through small groups
- variety of options

**Level of Readiness to Integrate Technology into Curriculum**

Teacher educator should be in a position to couple the technology with new teaching learning approaches so as to improve the learning of students. ICT can improve the standard of education and learning of students. The challenge confronting our system of education is how to transform the curriculum and teaching process so that students can perform effectively in a dynamic, information rich and continuously changing environment. ICT can change the traditional concept of learning process and develop new processes based on digital technology. It can definitely create a new learning environment and information rich society. It is essential to redefine the role and responsibility of students of ICT in 21\textsuperscript{ST} century. This is nothing but student centered learning (Manoj Kumar Dash, 2007). Successful integration of ICT into teacher education is the extent to which teacher educators have the knowledge and skills for modeling the use of ICT in their own practices.
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 skills efficiently. 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.

Present day Status of a Teacher

The teacher in the emerging Indian society has a very crucial role in the social reconstruction and in the transmission of wisdom, knowledge and experiences of one generation to another. Children are the potential wealth of a nation. They are always exposed to the information of the teacher. It is therefore necessary to realize that the emerging Indian society can achieve all round development with the help of the teacher who acts as a powerful agency in transmitting its cherished values. A teacher is not only a custodian of a nation values but is also an architect par excellence of new values. A teacher can help our country in the process of reconstruction. But so far we have not been able to harness this extremely useful manpower. This could be possible if the teacher’s role is properly recognized and he is in proper frame of mind to understand the problems of the country and make a sincere effort to create a climate in which society can move forward. Dr. S. Radhakrishnan has apparently remarked, “Teachers place in society is of vital importance, he acts the point of the transmission of intellectual tradition and technical skill from generation to generation and helps to keep the lamp of civilization burning”. The secondary education commission has rightly stated, “we are however, convinced that the most important factor in the contemplated education reconstruction is the teacher, his personal qualities, his educational qualification his professional training and the place that he occupies in the school as well as in the community. Now with the increasing complexity of modern times, education faces ever changing new
demands, and mostly teachers have to bear the brunt of the changes. Hence, the teachers need to change their role.

**Role of Teachers in 21st Century**

The 21st century is witnessing not only an explosion of knowledge in science and technology but also an explosion of student population. These scientific and technological changes will make a heavy demand on the knowledge and role of the students which are going to play in the future. In the progressive world the students should develop the active and passive adaptability. Changes in society’s life demand corresponding changes in education and role of teachers in the 21st century. In order to equip the child to face the challenges of the 21st century, the teacher needs to perform a number of roles, explained in the following heads. (Najma Unnisa, 2007)

**Manager of Teaching and Learning**

The teacher should be the manager of the teaching learning process. The teacher has to teach and the learner has to learn. Both have to work as independent and dependent variables in the teaching learning process. Midway between them lie the intervening variables like the teaching learning situations, facilities and resources for teaching learning. Both teaching and learning should aim at the same thing achieving the desired instructional objectives, and help the learner to bring desired changes in his behaviour. In this way, the process of managing the teaching learning process variables involved in the teaching learning in such a way as to end with the best possible achievements of the set teaching learning objectives. For this the teacher in 21st century has to plan, organize, lead and control the effects of all the available new material resources and variables involved in the process of teaching learning ,in such a way as to achieve stated teaching learning objectives with maximum efficiency and effectiveness.

- As a manager the teacher has to exercise his managerial obligations and authority and take along with him a group of learners by making optimal use of the available resources for the realization of the stated teaching
learning objectives. In doing so, the teacher has to play sometimes an authoritarian role and at other times a democratic leader role.

- The teacher has to maintain perfect interaction with the students in all situations as the teacher himself or herself is responsible for the proper management of all the activities related to the process of teaching learning. These activities as emphasized by Davies (1971) in his work, “Management of learning” should be carried out through the four systematic steps named as planning, organizing, leading and controlling.

- As a manager the teacher should possess’ effective communication skills to transact communication effectively.

- As a manager the 21\textsuperscript{st} century teacher should be aware of the latest innovations, researches and experience in the field of education.

- The 21\textsuperscript{st} century teacher should be an active researcher and has to involve in experimentation.

- The teacher has to help in coordinating and enriching the efforts of the students and other resources engaged in the task of teaching learning.

- The teacher has to identify and utilize the appropriate teaching learning strategies, methods, facilities, teaching aids etc. that are available.

- The teacher has to secure the cooperation of authorities and community for improving the facilities and resources.

**Models for Teacher Professional Development in a Knowledge Society**

The following provide an overview of Canadian models for teacher professional development in a knowledge society. The models used illustrate the three modes of social interaction for professional development:

- Face to face interaction
- Face-to-face and online interaction
- Online interaction (human-computer interaction, and computer-supported social interaction).
School-based Models

The Champion Model

The programme, using both face-to-face and online training, blended work and study, while using the school curriculum and the teachers own innovative teaching strategies as the curriculum and the teachers own innovative teaching strategies as the vehicles for their learning. University resources and collaborative work teams, that carried over into the school day, provided challenging and motivating support. The use of technology in learning and teaching in the school became a natural part of the daily educational process. The program was integrated with the school certification process, resulting in a school action plan whose values, goals and activities were shared among the staff, thus confirming a direction for technology in a collaborative school culture. The school based decision making model of the school district facilitated some funding for this unique training and enabled the allocation of school, community and district resources to support the school's professional development initiatives. Keeping up with the technical knowledge while making it part of a realistic, on-going, comprehensive plan was difficult but was facilitated once the vision that developed during the professional development program in technology was shared.

The Teacher Leadership Model

This project is a school-wide initiative in all grades, with all teachers and staff, and is led by a technology team consisting of lead teachers in the school. The project not only promotes technology but inspires teacher leadership. Teachers in the school develop and deliver their own professional development for all teachers in the school in all technologies. The focus of the school's project is to integrate technology into curriculum where it can be used as an everyday tool. The professional development is teacher-led; all technology skills of students are tracked as reading skills are tracked; a school-wide database of technology skills is maintained at the school; the project is led by teachers and is a dynamic and evolving project.
The School-within-a-School Model

This is a model where teachers and learners are teaching and learning with a laptop computer given to each person. The program is oriented towards a proactive or professional approach to the integration of ICT into teaching and learning. Project-based learning is both the result of the year-one teachers that focused on this approach for up to 65% of class time, and the support of the school and the school district that made this approach workable. Partners include parents who pay for the laptops and pre-service teachers. The Department of Education as well as private partners also provide resources for professional development. Bi-monthly half-day meetings are for the collaboration action-research projects should be conducted within the school. Cooperative learning, curriculum integration, and a learning community model are also part of the renewal that is undergoing. Bridges to other classrooms to be established, learning projects are to be conducted concurrently. Pre-service teachers work in both "schools", and used at times the same web-based discussion forums. The school teachers will have the full support from the school; district and professional personnel (e.g. math and computer specialist as well as project-based specialist) contribute in a number of ways.

The Self-directed Onsite Online Professional Development Model

Teachers attend conferences, as participants and presenters; take college and university courses and seminars, both online and in person. There is great emphasis on cross-disciplinary meetings and discussion, greatly facilitated by the use of groupware after school working hours. Teachers engage in Professional Development on school time, teacher time, in both synchronous and asynchronous modes, and both face to face online. The content includes basic skills as required, but for the most part involves learning the pedagogical and collaboration skills.

The Community-Oriented Model

In this model, the school administration, with its commitment to advancing the integration of technology into the curriculum and best practices of learning and teaching, works closely with its teachers, students, parents, school district leadership and the Department of Education to take advantages of the programs that are available. In addition to being seen as a powerful teaching and learning
tool and a vehicle for professional development, technology is seen as a motivating force that works best when it is a natural part of the culture of the school. Through the use of a school lab, internet access and locally connected classrooms, the school administrator models the use of technology in her teaching and volunteer professional development sessions with the staff after school. Weekly staff meetings are plans for feature technology.

The school participates actively in community programs and initiatives particularly related to technology integration, and through participating in some of these programs, hardware can be purchased and computer technology is opened in a natural way to students, teachers and the community. Also, by encouraging technology leaders on staff, by using older students to assist those teachers less technologically comfortable and by opening the school's technology to the community, these relationships facilitate the development of a community of learners.

**The Small/Smart Steps Model**

The emphasis has been on role modeling, with teachers' beliefs and perceptions considered, along with a significant amount of teamwork in the context of a collaborative culture.

**The Web-site as a Shared Task Model**

With the help of a lead teacher that had begun to develop a web-site to support her own teaching, three other teachers and the assistant principal submitted a project to their local university as an associated school for pre-service education as part of this small scale project. The team put together a professional development plan that included technology skills as well as pedagogical skills (cooperative learning, project-based learning, and integrated curriculum).

**The Cross-Curricular Multimedia Instructional Unit Model**

The content of the project emphasized the pedagogy of the various curriculum involved, treating the pedagogy of the technology very much as a tool for the former, and moving quickly to the use of such tools as the scanner and the digital camera and the building of webpages. The concepts of each of integrated curriculum, project-based learning and cooperative learning are integrated into the
program and encouraged, with a further emphasis on performance assessment in that the students are expected to produce an invention.

**The Mentor Model**

This model involves teachers mentoring other teachers in integrating ICT in teaching and learning. This mode of professional development is based on person-to-person relationships, and mentors going to the classroom of interested teachers that have at least one computer in it. Most teachers also have access to a computer at home. The mentor has successfully integrated ICT in his or her classroom in the past. Professional development with the mentors also includes weekly after-class meetings. Topics vary according to interests and needs of the teachers (software, cooperative learning, and project-based learning). With the help of the mentors, teachers develop learning activities to be implemented in each of their classrooms. Teachers may join mentors on the phone or by email at all times.

**The Computers for Lunch Model**

What teacher needs to know about computer literacy is made easily digestible, byte-size servings in this web-based self-instructional computer-literacy course for teachers and would-be teachers. Teachers are able to complete the course individually or collaboratively, in 20 minute lunch-hour sessions, with enough time left over for lunch, and even a break and a chat with colleagues. Materials and resources for instruction are made available to teachers for "downloading" (which just means copying from the Internet web site to the computer they are working on and able to be printed out from the school printer for immediate classroom use). Instructions are provided for how to "download" any instructional materials teachers want to use with their classes.

The program seeks to empower teachers to approach a new application and have a sense, both conceptual and practical, of how they might use it. The idea, in essence, is this don't teach people what a program expects from them, teach them what to expect from the software. Then they can sit down in front of almost anything and have a sense of how it should work.
The College-wide Model for Professional Development of Faculty

The use of instructional technology and the development of exemplary post-secondary learn aware is promoted through a broad series of initiatives designed to lead staff through three phases of cognitive development. In the awareness phase, faculty is been exposed to the potential of instructional technology through demonstrations, seminars, online conferencing and hands-on exposure to hardware, software and online resources. The emphasis has been on peer presentations, "faculty show and tell", to increase buy-in, reduce technophobia and alleviate fears of redundancy. These efforts, coupled with the intense media coverage of new technology have ensured that majority of staff members are aware of the increasing role that interactive, instructional technology can play in education.

In the training phase, several approaches are taken to training professors in new media development, recognizing the steepness of the learning curve in acquiring the knowledge and skills necessary for multimedia development. The first approach is to recognize that the professor is most appropriately designated as a content expert who needs to be supported by a team of technical, creative and instructional design specialists. This is most appropriate when the project being undertaken is complex and sophisticated. The second approach has assumed that the material being designed is adjunctive and more presentation than interactive multimedia. In this latter case, success is achieved by targeted training in software and hardware appropriate to the scope of the project. In the Implementation phase and with respect to the objectives above, several major initiatives may be taken such as the establishment of a learning center to provide the technical support to convert the faculty's designs into online or other multi-media format. In addition, faculty may drop into this center anytime to obtain ongoing, just in time and as requested assistance in developing any technology based curriculum materials of courses.
**District, Group of Schools, and Partner-Driven Models**

District models, seem to be characterized by the following cascade model (teacher representing school and assumed to teach their colleagues back at school); peer coaching and "just in time learning"; networks of contact persons. There seem to be a progression from a simple cascade model (without much local structures to support the peer coaching) to a structured network approach (in which a system is put in place, through a variety of mechanisms, so that peer coaching happens at a deeper level).

**The Inclusive Partnership Model**

The professional development program was presented as a smorgasbord for "gourmet omnivores", with teachers selecting technology topics of their interest. From this approach there came small teams of teachers, who become trainers for other teachers. Also, it was understood that there would be on-going staff development in technology, such as after school training, the use of the four professional days and the release days allocated to the school by the school board. Many staff members were involved in related university courses.

The integration of technology in learning and teaching was facilitated by every teacher having a lap top, every class with at least three computers and a fully equipped school lab (without a lab teacher) into which regular classes and their teachers were scheduled. Also, the lab was heavily used by students and teachers during unscheduled time. Much of the training in technology used the curriculum and innovative instructional strategies, such as cooperative learning and multi age/multilevel teaching, as the content through which the technology was learned. More creativity was used in scheduling classes to facilitate the integration of technology in learning and teaching. This technology training included support staff and involved parents, thus embedding technology into the culture of the school.

**Learning Partnership Model**

This is a private-public sector partnership. The key feature is the focus on the development of teacher skills firstly, provision of hardware, integration to
curriculum and connectivity to other teachers for continued professional development. Additionally, the project's major goal is the development of collaborative cultures in schools.

**The Collaborative Action-Research Model**

This is a professional development project for teachers based upon action research. The essence of the project is to offer teachers the time and opportunity to try new things, to reflect upon their experiences and learn from others, thus realizing how technology can improve student learning and achieving and becoming, with technology, capable of much more doing. For the most part, basic technology skills and even most techno-pedagogical skills are assumed, with emphasis placed on learning and teaching with technology and research about sound uses of technology in the classroom. Given the pedagogical thrust of the project, other forms of innovative teaching such as integrated curriculum, project-based learning and cooperative learning are woven into the fabric of the project. Teachers have free access to computers in the Professional Development setting, while most have computers at home with no district-mandated incentive program. Various arrays of computers are to be found in the schools. Given that the essence of the project is action-research, reflective practice and critical inquiry follows easily and teachers begin to share their knowledge about how their work fits into the educational theory.

**The Cooperative Model**

This university-school project connects schools from rural areas to an established university. School boards have provided funding for professional development, and equipment to the schools. Some local communities also got involved, and offered computers to schools or free Internet access. The research project first provided teachers with technical training (word processing, email, introduction to Internet) etc, as well as training in cooperative learning. Professional development now includes face-to-face meetings with other teachers handling the same difficulties, and individual help to the teachers to effectively integrate technology in their classrooms. Support is also extended through electronic mail.
The Entrepreneurial, High-Tech Model

An entrepreneurial spirit permeates the system from the entrepreneurialism emanating from the supportive school district, to the business partnerships that equipped this high tech school, to the school leadership who ask of their teaching, "what knowledge and skills do we want our kids to have when they leave our school?", to the students' own initiatives in technology. A partnership provided a ratio of three students to one computer in a school with three fully equipped labs, a resource center of computer equipped pods, computers in every classroom and a computer for each of teacher.

Respected in-school practicing teachers with technology application backgrounds were used as coaches and when district personnel were used to help teachers with identified technology needs, coaching and "just in time learning" rather than large group presentations emerged as the most suitable professional development in the integration of technology in learning and teaching in this school. Through a supportive district infrastructure, and school/district entrepreneurial partnerships with business, coaching teams of teachers on the integration of technology in curriculum and innovative teaching practices became the most successful professional development model. Networks of teacher teams meet regularly to examine best practices and support each other in the use of technology. Departments and groups of teachers meet after school are released from teaching to explore with an experienced colleague some technology that they find pertinent to their teaching. Naturally, professional days are used for application training, often taught by a peer or a trainer for some identified need.

The Teacher Center Model

A variety of training sessions directed to promote the integration of ICT in teacher practice are offered such as technical training with word processing or the Internet, and pedagogical training on project-based learning, cooperative learning and skill development, and teaching strategies to integrate computers in the classroom. These training sessions take many forms. Some are offered during several days distributed over the year, others are held after school hours, and others still held during lunch conferences. Networks of contact persons in schools
are developed to further improve liaison with school teachers, and help create or expand teacher networks. The success of these networks is linked to the diminishment of professional isolation, by offering teachers the opportunity to share their knowledge and experience.

The Curriculum-Centered Model

This is professional development program focusing on the integration of technology into the curriculum. Teachers engage in face-to-face sessions and access the materials online. The program emphasizes modeling of best practices, usually through the use of video-conferencing, and assumes/supports other forms of innovative teaching, such as Integrated Curriculum, Project-based Learning and Cooperative Learning. Teachers are encouraged to develop school web sites.

The Three-Dimensional Model

There are three components to IT professional development in this model (a) self-directed professional development (teachers' centers, focused study groups lead by leadership team members, school-based study groups, school-based action research, after-school workshops and programs, consultation with district curriculum staff, distance learning options (web-based), and resource based learning (videos, journals, texts, audio)); (b) Board and Department of Education-Sponsored professional development (in school mentoring and coaching, school and district in-service sessions, summer institutes, out of district conferences, staff members on provincial curriculum leadership teams, after-school workshops and programs, teachers' centers planned programming, consultation with district curriculum staff, curriculum staff led professional development opportunities, Department of Education sponsored and lead professional development), and (c) Board Partnerships (partnerships for professional development activities/speakers, University graduate level action research program, University M.Ed. programs of study, long term in service relationships with University, Faculty, Summer institutes, Distance learning, after hours, partnerships for construction of new schools).
The Remote-Coordinator and Mentor Model

This is focused on a dedicated resource facility for all home-based learning families. It offers a variety of courses students who wish to receive their education outside of the traditional restrictions of time and space. Since the learning needs of students are unique, it must hire teachers who are particularly interested in students and their learning. However, these teachers must become technologically savvy very quickly. Further, their knowledge and skills must be constantly up-dated. Since the Professional development is very much individual and self-directed, teachers manage it and it is strictly a school-based program, with, however, clearly-stated goals and expected outcomes and a great degree of role modeling. Given that it is internal to the staff, it is usually face-to-face, continuous and takes a variety of forms, and occurs approximately half on school time and half on teacher time. Teachers are encouraged to act or bring a computer at home. The content touches on basic Internet skills, and the use of the Internet for both information and communication, that quickly moves into the pedagogical skills necessary to integrate the technology into all subject areas.

Key Characteristics or Ingredients of Successful ICT Teacher Professional Development

To reach the goal of preparing teachers for effective technology use, a well-designed professional development program is essential. Professional development in a technological age requires new definitions and new resources. It cannot take the traditional forms of individual workshops or one-time training sessions. Instead, it must be viewed as an ongoing and integral part of teachers' professional lives. Professional development for technology use should be an integral part of the school technology plan or an overall school-improvement plan, not just as an add-on. Initial inclusion in the technology plan ensures that professional development is considered as an essential factor in using technology to improve teaching and learning.

Professional development for technology use should contain essential components that research has found to be important. These components include the
following: a connection to student learning, hands-on technology use, variety of learning experiences, curriculum-specific applications, new roles for teachers, collegial learning, active participation of teachers, ongoing process, sufficient time, technical assistance and support, administrative support, adequate resources, continuous funding, and built-in evaluation.

**Connection to Student Learning**

The ultimate goal of professional development is to improve student learning. Schools should provide teachers with abundant opportunities to become fluent in using technology to bolster instruction and help students develop higher-order of thinking and problem-solving skills. As a result, the use of technology enables teachers to implement new teaching techniques, to help students work collaboratively and develop higher-order thinking skills, to encourage students to be engaged in the learning process, to assist students who have various learning styles and special needs, and to expose students to a broad range of information and experts.

**Hands-on Technology use**

Recent research has shown the importance of current professional development emphasizing hands-on technology use. Teachers who received technology training in the past year are more likely than teachers who hadn't to say they feel 'better prepared' to integrate technology into their classroom lessons. They also are more likely to use and rely on digital content for instruction, and to spend more time trying out software and searching for web sites to use in class.

Initially, teachers will need to acquire core technology competencies and skills; but during these initial experiences, teachers should be thinking in terms of how the technology can enhance student learning and how it can be used in different content areas. Hands-on technology use at school and at home allows teachers to develop confidence in their skills and a comfort level with the technology. When teachers are accustomed for using the equipment to boost their own productivity, they are more likely to see ways in which similar uses could support the projects that they want their students to do.
Variety of Learning Experiences

To help teachers incorporate technology in many ways that support powerful instruction requires an array of professional development experiences quite different from traditional workshops and how-to training sessions. Whatever the format, effective professional development utilizes key points from adult learning theory. Adults require relevant, concrete experiences with adequate support, appropriate feedback, and long-term follow-up. This type of professional development is very different from traditional one-time teacher workshops. Research indicates that teachers learn and incorporate new information best when it is presented over a long time frame instead of a single session. Preferably, new strategies are modeled during routine school days in the classroom. Such practical demonstrations encourage teachers to accept and use the new strategies in their own classrooms. Teachers then need opportunities for hands-on experience in using the new skill, developing a unit, and implementing it. Finally, follow-up support as well as opportunities for ongoing discussion and reflection on the new procedures is essential in ensuring change. Practice logs can promote these helpful activities. Such logs can show how often teachers use a new practice, how it worked, what problems occurred, and what help they needed.

Curriculum-Specific Applications

If technology is to be used to produce improvements in student achievement, teachers must see a direct link between the technology and the curriculum for which they are responsible. Professional development for technology use should demonstrate projects in specific curriculum areas and help teachers to integrate technology into the content. In particular, professional development activities should enhance the teachers' curriculum learning and assessment competencies and skills as well as classroom and instructional management competencies and skills. Specific content can help teachers analyze, synthesize, and structure ideas into projects that they can use in their classrooms.
A good professional development program is job embedded and tied to learning goals: It provides activities in the context of practice. The best integration training for teachers does not simply show them how to add technology to their teaching but to understand what they are doing. It helps them to learn how to select digital content based on the needs and learning styles of their students, and infuse it into the curriculum rather than making it an end in it. Using technology effectively also requires having a wide repertoire of teaching approaches.

**New roles for Teachers**

Technology encourages teachers to take on new and expanded roles, both inside and outside the classroom. Within the classroom, technology supports student-centered instruction. The teacher assumes the role of coach or facilitator while students work collaboratively. Outside the classroom, technology supports teacher collaboration. Instead of working in isolation, teachers can work together on school-wide programs that they can help find solutions to problems, act as peer advisors to provide information and feedback, and collect data to test hypotheses. Their new roles may involve distance collaboration with cross-school peer groups and study groups through telecommunications. Professional development for technology use provides opportunities for teachers to become comfortable and effective in these new roles.

**Collegial Learning**

A professional development curriculum that helps teachers use technology for discovery learning, developing students' higher-order thinking skills, and communicating ideas is new and demanding and thus cannot be implemented in isolation. In addition to working in pairs or teams, teachers need access to follow-up discussion and collegial activities, as required of professionals in other fields. Teachers also need time to discuss technology use with other teachers, whether face-to-face, through e-mail, or by video-conferencing. Creative ways should be developed to build teacher networks so that teachers have additional opportunities to discuss the new instructional methods that technology promotes.
Active Participation of Teachers

If technology is to be used equitably for all students, a majority of teachers should be included in the professional development program. One strategy to motivate teachers to spend the time and energy necessary to develop technology competency is to mandate participation in technology professional development. Another strategy for encouraging teachers to participate in professional development for technology use is creating incentives for technology use. Possible incentives include the following: a judicious use of contingency pay, in which a certain segment of the teacher's base pay (such as 5 percent) is reserved contingent upon participation in a wide range of professional development activities; bonuses; or a compensation system that rewards knowledge and skill along a career continuum. A less traditional incentive program could give teachers credits for hours spent in professional development; teachers could use these credits to earn technology for their classrooms, loans of hardware and software to be used at home, or reduced prices on personal equipment. Mini-grants might reward teachers who have innovative ideas for using technology in instruction.

Incentives must be used carefully, however. Although group rewards may motivate some teachers, individual rewards may increase competition among staff or lead to less equitable distribution of technology. The only way to ensure that all students have the same opportunities is to require all teachers to become proficient in the use of technology in the content areas to support student learning.

Ongoing Process

A high-quality professional development program is conducted as an ongoing process, not a one-shot approach. Teachers need continued practice to become comfortable with and to implement change, especially in technology use. Professional development takes time and must be conducted over several years for significant change in educational practices to take place. Administrators must take into account this long time frame, and teachers must be prepared to be involved in professional development throughout their careers.
**Sufficient Time**

An effective professional development program provides sufficient time and follow-up support for teachers to master new content and strategies and to integrate them into their practice. For any professional development activity, teachers need time to plan, practice skills, try out new ideas, collaborating, and reflecting on ideas. Acquiring technology skills and becoming proficient at new ways of teaching in which technology is appropriately integrated requires additional time. Teachers need large blocks of time to gain initial familiarity with new hardware or software, learning and practicing for sustained periods. Time built into teachers' schedules can provide teachers with opportunities to discover what the technologies can do, learn how to operate them, and experiment with ways to apply them. To address these professional development issues and to acknowledge that the demands of engaged learning using technology may lead to longer class periods, more team teaching, and more interdisciplinary work. Some adjustments may have to be made to the school-day schedule. One adjustment might consist of arranging preparation time for teachers in the same content areas to coincide in order to allow collaboration in planning and study. Another adjustment is to make small changes in the daily schedule programme in order to make a substantial difference over time.

**Technical Assistance and Support**

Another important component of effective professional development for technology is to access on-site technical support personnel who are responsible for troubleshooting and assistance after the technology and lessons are in place. When teachers are trying to use technology in their classrooms and they encounter difficulties, they need immediate help and support. Technology which is not easily accessed and implemented will not be used. Teachers will return to more traditional ways of teaching if the problems they encounter cannot be solved quickly and efficiently. Schools, therefore, have a vested interest in providing technical support. “The best way to win widespread use of new technologies is to
provide just-in-time support, assistance, and encouragement when and as needed. Not tomorrow. Not next week but now

**Administrative Support**

Fully implementing an effective professional development program as part of a well-designed technology plan requires support from school administrators and leaders. Administrators must have a clear vision of technology to support student learning and an understanding of the roles that all school staff must play in achieving that vision. They must be the cheer leaders and visionaries who see beyond the daily routine to a vision of what is possible through the use of technology. Administrators also can participate in professional development activities so that they are aware first and of how technology is used and what problems are experienced by the staff. It is also important for each administrator to have a network computer on his or her desk for using in daily tasks. In fact, professional development in technology use for teachers will not be successful unless the principal is invested in the process.

**Adequate Resources**

The overall technology plan and its professional development component cannot occur without a significant commitment of resources by the school district. The district, first of all, must purchase the type of technical equipment necessary to meet the learning goals identified and provide for ongoing maintenance and upgrading. Skimping on this step can be more expensive in the long run because teachers and students eventually will want and need access to multiple technologies (such as CD-ROM, satellite, and full-motion video) that will enhance the curriculum and expand learning opportunities. The technology used for professional development should be the same as the technology used in the classroom. Funds should be available to provide teachers with technology that they can use at home or in private to become comfortable with the capabilities it offers. Funding also should be considered for a network computer on every teacher's desk to allow telecommunications support for teachers and provide easy access to
programs and files. A significant portion of the technology budget should be allocated for professional development.

**Continuous Funding**

Finding the funding for ongoing technology needs and professional development can be difficult. The costs of using technology to improve teaching and learning should become a line item in school budgets. These costs are not considered as one-time investment but an ongoing expense. This approach may require rethinking a school district's funding priorities.

**Built-in Evaluation**

Effective professional development uses evaluation to ensure that each activity is meeting the needs of the participants and providing them with new learning experiences. Evaluation is built into the professional development program during the planning process, before the actual activities begin. It consists of three types, preformative evaluation, formative evaluation, and summative evaluation. Preformative evaluation assesses educators' needs during the planning process. During this phase, intended goals are clarified and strategies for gathering data about reaching them are set using agreed-upon guidelines for evaluating professional development. Evaluation continues with formative evaluation, which is conducted during the professional development activity. Formative evaluation provides feedback and determines changes that can be made during the activity to make it more valuable to participating educators. The evaluation process concludes with summative evaluation, which is conducted after the activity. Summative evaluation allows participants to judge the overall merit or worth of the activity and gives decision makers the information they need to plan for the future. Good summative evaluation uses a variety of techniques to gauge five levels of professional development evaluation. These levels are participants' reactions, participants' learning, organizational support and change, participants' use of new knowledge and skills, and student learning outcomes.

The ultimate goal of evaluation is to determine whether professional development promotes using technology to improve student achievement. No
longer can administrators simply assume that professional development is good by definition. Now that students are being held to higher standards, teachers are being held accountable for student achievement; educators must show that professional development has an impact on achieving the learning goals that were identified in the original plan. This part of the evaluation process assesses whether the specific learning goals for students using technology have been met or whether unintended results have been achieved. Using multiple measures is essential. These measures might include grades, scores from standardized tests, and results from alternative assessment (such as portfolio evaluations that focus on students' ability to use higher-order thinking skills). School-wide indicators such as enrollment in advanced classes, membership in honor societies, participation in school activities, disciplinary actions, and retention or dropout rates also might be considered. Sources of this information might include student and school records, questionnaires and interviews with students, parents, teachers and administrators. This information can be used to document the return on investment from professional development. It also allows teachers to evaluate how technology improves the quality of student learning.

For teachers to implement technology in the classroom to increase engaged learning and improve achievement among their students, a well-planned professional development program for technology use is essential. Such a program gives teachers the skills they need to incorporate the strengths of technology into their lesson planning rather than merely to add technology to the way they were always doing things. Effective professional development requires careful planning, job-embedded and hands-on activities directly linked to the curriculum, plenty of follow-up, built-in evaluation using several assessment techniques, adequate time, sustained funding, and the willingness of educators to take on new and expanded roles.
Barriers and critical success factors for effective teacher learning

The following barriers and critical success factors are frequently identified as implementation pitfalls for effective teacher learning.

Lack of systemic attention to sustained work-based teacher development

One of the greatest barriers to effective professional development is the absence of the conditions for effective, ongoing professional development built into the daily working lives of teachers.

Funding & Time

Teachers, researchers, and policymakers consistently indicate that the greatest challenge for implementing effective professional development is lack of time. Teachers need time to understand new concepts, learn new skills, develop new attitudes, research, discuss, reflect, access, try new approaches and integrate them into their practice; and time to plan their own professional development.

Time is also a significant budgetary issue, when it involves funding teachers’ time to participate in professional development activity. Increased allocation of funding is necessary if ‘teacher relief’ is required to enable teachers to participate in any professional development activity. The issue of whether professional development is an organizational or personal responsibility is not resolved and is an issue that has industrial as well as professional implications. A major theme in prisoners of time, the National Education Commission on Time and Learning report (1994), is that U.S. students and teachers are victims of inflexible and counterproductive school schedules. School schedules do not normally incorporate time to consult or observe colleagues or engage in professional activities such as research, learning and practicing new skills, curriculum development, or professional reading. Typically, administrators, parents, and legislators view unfavourably anything that draws teachers away from direct engagement with students. Indeed, teachers themselves often feel guilty about being away from their classrooms for restructuring or staff development activities.
Although time is consistently identified as a crucial key for successful professional development (or, more often, lack of time identified as a barrier), the mere provision of time alone is unlikely to eventuate in significantly changed practice in the use of ICTs. Importantly, the provision of time for ICT professional development must be the one component of multi-faceted planning. More crucial still is the recognition that the provision of time must accompany a major redefinition of the nature of teachers’ work.

**Link between Pre-service Teacher Education and Educational System**

The lack of linkage between pre-service teacher education and educational system creates a cycle of difficulties for any innovation or change within the education sector. On the one hand, the teacher education programs find that the schools in which their student teachers undertake their professional experience, do not have the resources, expertise or classroom practices that support student teachers becoming competent and confident in that area. On the other hand, employers find that new qualified graduates do not have the necessary skills and understandings that are required for effective teaching in their schools and classrooms. Often this dilemma is characterized as a chicken and egg situation, where one cannot happen without the other, but neither can ‘be first’ without the other. New thinking is needed if there is to be any resolution of the serious and recurring problem which extends well beyond the area of the integration of ICTs for teaching and learning.

**1.2. Statement of the Problem**

The global adoption of ICT in the education field has often been premised on the potential of the new technological tools to revolutionize and improve the educational system, better prepare students for the information age, and accelerate national developments efforts. The problem with the current technology implementation plans is not only their focus on the potential of the technology per se, but also their failure to base their implementation efforts on research and enough information gathering. A key element seems to be left out in the ICT plans and their subsequent implementation processes, the perceptions and views of the
policy executers and the real agents of change within the classroom, namely the teachers. It is widely accepted and applies that unless teachers develop positive feelings towards ICT, they will not use it in their teaching practice.

While the study of teachers’ perceptions is important, and more significant importance is the identification of those factors that may influence their perceptions, either positively or negatively. The supportive and motivating factors as well as hindrances, all influence teachers perceptions and therefore should be taken into consideration when examining them. Since the introduction of ICT into schools is imposed by policy, it is important to link the theory to practice and examine the impact of the policy on the ground. The relationship between perceptions towards ICT and the policy that introduced it in the first place seems to be lacking in north coastal districts in Andhra Pradesh. This calls for a study that investigates teacher’s current ICT use and perceptions and examines the extent of educational policy impact on teachers practice and feelings.

The purpose of this study is, therefore, to look at teacher’s current ICT use and their perceptions towards it and investigate the impact of educational policy on teachers’ feelings towards use of ICT. The study will also elicit teachers views on the future of education, as it is important to take teachers’ opinions on current and future issues into consideration before implementing policy, because no policy will achieve its aims and fulfill its objectives if its field executers are not fully aware of it as a result of lack of involvement or do not believe in it. Moreover, exploring teacher’s views of future education will fill the gap that exists in the north coastal districts in Andhra Pradesh which has over looked the importance of eliciting the view of field executers prior to forming future policy.

1.3. The Research Problem
1.4. **Significance of the Study**

The significance of this research stems from its contribution of knowledge, particularly its generation of useful information to support future development in the use of computers in educational system in north coastal districts in Andhra Pradesh. After analyzing the data, it is hoped that the results of this study will:

1) Provide north coastal educators with new understandings of, and insights into secondary school teachers usage of ICT in the classroom and their perceptions of it, indicate factors influencing teacher ICT use and identify enablers and obstacles of full integration of ICT in the field of education. In addition, presenting teachers views on current ICT policy and its influence on their teaching style will enable policy makers to make decisions based on informed judgments rather than intuition.

2) Provide state government of secondary education in Andhra Pradesh with new information relating to issues which need to be considered in addressing future educating policies.

3) Lead to further in-depth research on teachers’ uses and perceptions of ICT.

4) Give insight into teacher’s views on probable/preferable future utilization of ICT in the teaching and learning process. This will inform policy makers about the extent of their awareness of such utilization and their expectations of new policies, reforms or initiatives launched by Government of Andhra Pradesh of Secondary Education.

5) Open the way for research on the future of education in the Andhra Pradesh context.

1.5. **Scope of the Study**

The present study is considered to investigate only secondary school teachers towards using ICT of working in government and private schools, rural and urban schools. The study is also limited to the secondary school teachers of North coastal districts (Srikakulam, Vizianagaram and Visakhapatnam) in Andhra Pradesh.
1.6. Objectives of the Study

The following objectives are framed for the present study.

1. To find out the usage of ICT by teachers during the teaching and learning Process.
2. To identify the barriers and supporting features on use of ICT
3. To determine the key areas of policies and awareness in education with special reference to Andhra Pradesh State.
4. To find out the views of teachers towards the use of ICT for classroom transaction.
5. To analyze the present status of use of ICT at secondary school level.
6. To explore the feeling of teachers towards the possibility of future expectations in educational practice.
7. To know the difference of ICT utilization between government and private teacher within three districts (Srikakulam, Vizianagaram and Visakhapatnam).

1.7. Hypothesis of the Study

Hypothesis is a tentative generalization which provides basis to the whole study to be tested by facts. The hypothesis to be tested in this study is “Null Hypothesis”. Ordinarily, a null hypothesis is a statement to believe that there is no relation between or among variables. Once it is formulated, depending on the outcome, it will be either accepted or rejected. For the present study keeping the above objectives in view the following hypothesis were formulated.

**Hypothesis -1**

There is no significant difference between government and private school teachers towards the dimensions of ICT utilization.

**Hypothesis –2**

There is no significant difference between rural and urban teachers towards the dimensions of ICT utilization.
Hypothesis – 3
There is no significant variation between Telugu and English medium teachers towards the dimensions of ICT utilization.

Hypothesis – 4
There is no significant difference between male and female teachers towards the dimensions of ICT utilization.

Hypothesis-5
There is no significant difference between below 40 years and above 40 years age group teachers towards the dimensions of ICT utilization.

Hypothesis-6
There is no significant difference between teachers with Post Graduates and Under Graduates qualifications towards the dimensions of ICT utilization

Hypothesis-7
There is no significant difference between teachers with B. Ed and M. Ed qualifications towards the dimensions of ICT utilization

Hypothesis – 8
There is no significant difference between below 10 years and above 10 years experienced teachers towards the dimensions of ICT utilization

Hypothesis-9
There is no significant difference among various subjects (English, Telugu, Hindi, Mathematics, Science and Social Studies) teachers towards the dimensions of ICT utilization

Hypothesis- 10
There is no significant difference among the districts Visakhapatnam, Srikakulam and Vizianagaram with regard to their usage of ICT.
Hypothesis- 11
There is no significant difference between government and private school teachers towards the dimensions of ICT utilization within Visakhapatnam district.

Hypothesis- 12
There is no significant difference between government and private school teachers towards the dimensions of ICT utilization within Srikakulam district.

Hypothesis – 13
There is no significant variation between government and private school teachers towards the dimensions of ICT utilization within Vizianagaram district.

Hypothesis-14
There is no significant correlation between the dimensions of ICT utilization scale and demographical variables.

Hypothesis-15
There is no significant intra correlation between dimensions of ICT utilization scale.

1.8. Strengths and Limitations of the Study

Strengths

Only a few studies on ICT use have been carried out in India. This study therefore contributes to this growing body of work. The main strength of the current study is that it is the first local study that provides findings from well designed implemented research on teachers ICT use and perceptions towards this usage as well as their views on the future of education which can be used to inform present and future educational policy. The study has also yielded up to date information on teachers perceptions of the use of ICT in the classroom as well as identified those factors supporting and hindering of this use, which all add to the limited literature on ICT use in north coastal districts secondary schools. This information will inform education planners in north coastal districts of the current perceptions of secondary school teachers, has several implications for the professional
development of teachers and reveals several control factors that need to be asserted to encourage teachers to use ICT in teaching.

Six hundred secondary school teachers were participated in this study, questionnaire which is considered an adequate sample size to create confidence in the reliability of the results. More importantly, the study included male and female teachers and this has several implications for the quality of the study. First, as far as the researcher is aware, very few Indian studies have addressed male and female ICT related issues in the same study, due to the difficulties faced by any researcher wishing to access opposite gender schools. The fact that this study was able to fill this gap in research activities in north coastal districts are a huge achievement and contributes to the strength of this research.

Second, including male and female teachers in the study positively influenced the interpretation of findings and assisted a better understanding of north coastal teacher’s usage of ICT, perceptions towards it, and future views of education. Exploring one side of the story, i.e. the female and living out the male, would have ultimately weakened claims that the studies findings could be considered representative of teachers usage of ICT in general since, the findings would have been confined and representative only of female teachers usage of ICT, perceptions, and future views. Moreover, since the researcher was part of the culture in which this study took place, this is strength of the study since he was fully aware and could comprehensively understand the interaction between research participants and their environment and interpret them within the context in which they have occurred.

Another strength of the study was its ability to adapt various data collection instruments, questionnaire, and developed it for this research for better suit the north coastal district context and hence reflects actual local teachers ICT usage, perceptions, and future views. Moreover, although this study was dependent mostly on western based literature in both the review of related research and interpretation of findings, it confirmed that similar patterns of ICT usage,
perceptions, and supporting and hindering factors exist in north coastal districts schools as in other countries, although there are some important differences.

**Limitations**

The study was geographically limited to secondary schools of Srikakulam, Vizianagaram and Visakhapatnam districts of north coastal Andhra Pradesh. Data was collected for this study only through the use of questionnaire. However, given the constraints of time and resources available for the study, it was considered essential to select only north coastal districts instead of drawing a sample from schools in other cities and towns, because such strategy would have necessitated more time and economy. In addition, the study could have been usefully expanded to cover student’s vision of the future of education, and the differences between teachers and students views could have been examined. Moreover, a comparison between teachers and students vision might have assisted in creating the preferable future scenario which policy makers should consider when formulating policies in order to achieve such scenario.

**1.9. Organization of the Thesis**

The study is divided into five chapters namely introduction, Review of related literature, Methodology, Analysis and Interpretation, findings and conclusions.

The first chapter introduction consists of the brief information regarding the various parameters existed in the study. Statement of the problem, title of the study, Significance of the study, objectives of the study, Hypothesis of the study, scope of the study, strengths and limitation of the study and organization of the study.

The second chapter review is related to literature which consists of the literature of various studies which are related to this topic. These reviews were collected by the investigator from various journals and through internet. The reviews were categorized into different sections like Teachers use of ICT, Barriers
and supporting features of ICT, Feeling towards ICT, Policy and ICT, Future Education and ICT and Integration of ICT in secondary Education.

The third chapter methodology is related to the area of study, operational definitions of key terms, population and sample of the study, the method of study, sampling technique, the research tool used, various statistical techniques used in the analysis of the data and strategy of scoring the data.

The fourth chapter analysis and interpretation with the data collected, tabulation of data and the interpretation of the various statistical results.

The fifth chapter findings and conclusions furnish the results obtained by the various interpretations. Interpretations are given according to the hypothesis considered. Implications of the study were provided. Suggestions for the further study are also given in this chapter.

At the end in Appendix the tools used for the study is appended. In bibliography various books and journals that are referred are mentioned.

1.10. Summary

This chapter has provided the reader with an introduction to the research study. From the above brief description of the education system in India, it can be seen that an increasing importance is being paid to ICT in education in particular and in the country as a whole in general. Introducing ICT into education is now a governmental tropism towards improving and developing the current educational system. So that India will be able to compete with other developed nation.