

CHAPTER ONE

INTRODUCTION, SIGNIFICANCE AND SCOPE OF STUDY

Every country develops its own system of education which undergoes transformation to meet the challenges of the changing times. Educational system in India is also confronted with several new choices, opportunities and challenges to ensure that a modernised, progressive and qualitatively superior system of education can be implemented at all levels. The report of the Indian National Knowledge Commission affirms a commitment to build excellence in the educational system to meet the knowledge challenges of the 21st century and increase India's competitive advantage in fields of knowledge (NKC, 2009).

“India, being a developing nation, is facing grave problems like poverty, illiteracy, malnutrition, environment degradation, regional disparities etc. Under these circumstances a sound system of education alone can provide solutions to these issues.”

Out of all educational levels, secondary education serves as a link between the elementary and higher education for an individual. Thus, it plays a very important role as a child's future would depend a lot on the type of education he/she receives at the secondary level. Apart from strengthening the roots of education of a child, secondary education can be instrumental in shaping and directing a child to a bright future. The National Policy on Education (NPE, 1986) has called for strengthening secondary education by providing environmental awareness and science and technology education. As succinctly observed in the National Policy Document;

“Science education will be strengthened so as to develop in the child well defined abilities and values such as the spirit of enquiry, creativity, objectivity,

the courage to question, and aesthetic sensibility. Science education programmes will be designed to enable the learner to acquire problem solving and decision making skills and to discover the relationship of science with health, agriculture, industry and other aspect of daily life”

The above said recommendation by NPE (1986) clearly indicates that effective science teaching in schools is essential, and that is why all commissions and councils have given a priority to the improvement of teaching and learning of science in schools. They have one common yet important objective of creating an educational environment that is considered to be effective in science teaching and learning as progress in science is recognised as the key to progress in all walks of life. Science gives pupils the means required to enhance their understanding of the world around them. It encourages curiosity and a critical outlook. It throws light on the relation between human beings and nature and reminds us that natural resources are finite and very precious. Science pervades all spheres of activity around us. We are surrounded by its products, from an audio player through digital instruments to computers. We all need a scientific culture for our survival into this fast growing world (Eurydice European Unit, 2006).

The researchers also believe that effective science teaching is essential for; a) ensuring a satisfactory degree of scientific literacy in society at large, and for equipping the next generation of scientists and engineers to progress into higher education and beyond (Science and Technology Committee, 2006); b) to secure the future of practical science in schools by discouraging the unsuitable methodologies (Broers, 2006). Secondary level science sometimes shows a more ‘stereotypical’ approach to those practical activities which are designed to lead to prescribed or self-evident conclusions). Science teaching deals with seven aspects; Innovation in science teaching: (trainee) teachers and teacher trainers, developing scientific ways of thinking through investigation, the contextual dimensions of science learning, applying information technology, science teachers and ‘common sense understanding’, responding to gender differences and the role of assessment in determining what is taught.

The links between teachers' scientific knowledge and skills, the ways in which they teach science and the consequences for the pupils depends upon the development of scientific ways of thinking by and for teachers themselves (Eurydice European Unit, 2006).

On the other hand, technology is also very important because it is being used in all fields of life including education. The system of education which happens to be the most important factor of development is under increasing pressure to use new technologies to prepare our future generations for the knowledge and skills they will need in future years. Our educational system is making efforts to employ a variety of technology tools into all areas such as academic, administrative and research. Technology is continuing to affect the academic transactions involving teaching, learning, research, extension activities in the universities, colleges, and other institutions. Use of mobile phones, televisions, computers, internet and machines, all are included in our day to day life. In fact, we are getting dependent on technology in our instructions, communication, transportation, information surfing, entertainment and for all kinds of necessities of life. Because of science and technology, most of the processes of human life have been either simplified or equipped with suitable and cost effective gadgets for saving time, efforts and cost etc.

The human mind can store only certain amount of information and this limitation can be very frustrating to those students who constantly seek new information to meet their level of curiosity. Inevitably, teachers need to adjust their teaching techniques to follow those that involve the transfer of pedagogy from the traditional approach to electronic (entirely online) or computer assisted classroom (courses supported in any way by computer technology) so that they can satisfy modern students who might otherwise face problems of adapting to the requirements of the new information age. This has led to the development of new technique of teaching and learning in the era of globalization. Information and communication technologies (ICT) have shaken the traditional teaching and learning approaches and have resulted in

the creation of new teaching and learning environments and instructional modalities for educational community. A successful integration of new technologies into teaching and learning processes will inevitably require from teachers' that they change their attitudes and teaching paradigms. Such changes will oblige them to adapt new methodological approaches, educational concepts and management aspects - all of which will have to be set in technology-rich environments.

1.1 Teaching Science at the Secondary School Level

Science is considered to be one of the most important subjects in the school curriculum because it can play a vital role in the development of human resources. In this regard, the NPE (1986) has suggested the following two main objectives for science education:

- i. to acquire problem solving, analytical skills and ability to apply them to the problems of everyday life besides promoting the spirit of inquiry and experimentation,
- ii. to discover the relationship of science with health, agriculture, industry and other aspects of daily life.

These objectives behind teaching of science as a core subject envisaged under the NPE (1986) can only be realised if our system of education addresses the problems which come in the way of development of scientific thinking, temperament and culture. For example, the present system of science education promotes passive learning rather than understanding and conceptual development (Laxman and Raja, 2003). Secondly, students consider science only as a subject in the curriculum for which examination has to be cleared after memorizing information given in the text book and do not enjoy learning the subject as a whole (Kapur, 2002). Teachers do not teach science so as to stimulate students' interests and curiosity. Some students have shown less interest in science due to costly and difficult education and limited job opportunities (Shukla, 2005). Similarly, in the absence of good science teaching, students are forced to join coaching classes and take tuitions to cope

up with the pressure of school examinations. Even though science occupies an important place in the national curriculum in schools, teaching of science has remained an area which needs to be improved and strengthened considering modern day educational requirements (Maheshwari, 1997; Marlow, 1999; Kapur, 2002; and Ichalkaranje, Jain et al.).

It has also been observed that science teaching in Indian schools needs a radical overhaul to stop students losing interest (Padma, 2005). Many notably scholars Balaram (2001, 2002), Mandal (2001), Virk (2000) and Rajput (2000) as cited in Chunawala (2006), have shown concerns on the decline of enrolment in science courses in higher education over the years. Ajaja (2009) has also pointed that science teachers themselves are not well positioned to teach science effectively. Their deficiencies include the use of inappropriate teaching methods for teaching sciences. The problem of poor teaching of sciences in the schools is linked to dearth of resources for teaching science, large class sizes of science students, very few qualified science teachers and competency problems' arising from the poor training of science teachers. This is a strong evidence of existence of an alarming problem with the quality of science education at the secondary stage which does not allow our students to make a decision to adopt science as a career.

In order to improve the quality of science education, NPE (1986) has suggested several measures. These include activity based learning, increase in laboratory work, fields trips and projects for developing the attitude and interest in science. It is hoped that these steps would be helpful in increasing the interest and achievement levels of school students. In addition to the measures suggested above, integration of technology is one such measure for the improvement of science teaching which has been suggested by both NPE (1986) and NKC (2009). But, the need of the hour is to consider, implement and adopt the important recommendations and suggestions with a strong emphasis on the overall development of the individual as well as the society.

The report of the National Knowledge Commission (2009) in its recommendations on school education has also mentioned that there is need to move away from rote-learning to understanding concepts, developing good comprehension and communication skills and learning how to access knowledge independently. This recommendation is equally applicable to the science teaching also. The National Focus Group on Teaching of Science (2006) in the position paper presented to National Council of Educational Research and Training (NCERT) has mentioned that there are three factors involved in science education; the learner (child), the environment - physical, biological and social (life) in which the learner is embedded, and the object of learning (science). One can regard good science education as one that is true to the child, true to life and true to science. There is varied content and processes of science teaching in schools in different states of our country and even conditions in classrooms are varied; teacher and student characteristics too vary widely, so it seems difficult to improve the practice of science education. One way out to solve these problems was provided by the research studies on teaching methodologies. Studies in the 1970's typically compared experimental classrooms with controls. New teaching aids were tried out, lecture method was compared with activity-based teaching methods, and so on. It was also emphasized that experiments are the hallmark of science, and for science learning, they are essential.

In India, there has been considerable work on developing simple, low-cost experiments for use in schools but more stress has been laid on doing experiments or watching demonstrations. Clearly, for experiment based science learning to be effective, there must be space and time for teachers and students to plan experiments, discuss ideas, and critically record and analyze observations. A good pedagogy must essentially be a well thought-out mix of approaches for teaching science. This report has addressed mainly three issues related to (a) science curriculum, (b) paradigm shift (discouraging rote learning) and (c) scientists, technologists, educationists and teachers should bring and launch new ways of testing students. There exists, in fact, an opportunity in the hands of researchers for evolving an effective teaching

learning system to achieve the objectives set for science education in our country.

1.2 Growth and Development of Educational Technology and ICT (Information and Communication Technologies)

After the invention of paper and the printing press, it became possible to record information as a result of which learners were able to refer to documents needed for learning. The paper revolution was followed by the invention of electronic machines especially; audio, video and computers. These inventions have made an important change in the delivery of learning materials inside a classroom. For example, modern school classrooms often make use of televisions, videocassette players and computers. These are being used as tools of instruction and learning in science and other subjects. All these tools can be considered as forms of educational technology. Because of the rapid development of information technology, there is a shift taking place from print-based learning to electronic learning through the use of advanced computing and telecommunication technologies. In the developed nations and even in developing countries, the rapid growth of technology infrastructure has led to the increased availability and use of computers in schools. In developed countries, though technology is being adopted by schools slowly in comparison to the way we have adapted ourselves to learn and use new technological gadgets and services in other spheres of activities (Raizada, 2012) yet most of the students have now access to computers, internet and other networks in their schools and even at homes. A majority of teachers in these countries also use computers or the internet for instructional purposes. This has made ICT (information and communication technologies) an important tool inside and outside a classroom for delivering educational materials to learners. Even in developing nations like India, many students and teachers are utilizing information and communication technology tools in the form of digital content, presentations, teleconferencing, internet, e-content, e-learning, mobile learning, electronic classroom, podcasts and virtual campus to varying degrees especially in metropolitan cities.

1.3 Science Teaching and Educational Technology: Importance

After more than twenty five years since the recommendations regarding science education were made by the NPE, it is being realised today that modern educational technology is now capable of becoming a major resource for the delivery of educational services in most parts of our country. This is so because modern educational technology provides capabilities for responding to new demands that traditional classroom education cannot meet adequately (Wang, 2009). It has been shown that in comparison to traditional classrooms, technology supported classrooms have the potential to improve instructions (Idayavani & Shanthi, 2003). For example, in comparison to traditional classroom, well designed computer mediated instruction is known to improve students' scores and attitude towards learning and decrease learning time (Baker et al., 1997). Also, the cost of information technology products and services for educational applications are dropping steadily and are becoming more affordable with respect to other items in the educational budget. No wonder, there has been much increase in their adoption and use in schools in all countries in general and India in particular (Desai, 1999).

In the document on the NPE (1986), experts had visualized such a situation 25 years back when they observed that; 'Educational technology will be employed in the spread of useful information, the training and re-training of teachers, to improve quality, sharpen awareness of art and culture, inculcate abiding values, etc., both in the formal and non-formal sectors. Maximum use will be made of the available infrastructure'.

Earlier, the report of Education Commission (1964-66) had rightly observed that "the science teaching can become meaningful and useful only if the methods of teaching are vitalized and proper facilities are provided for the teaching of subjects".

Science is essentially a practical subject and it is not likely to introduce entirely practical aspect only but theoretical aspect is also taken care of by the

curriculum developers. Under Indian learning conditions, science learning can be made interesting if the information is presented in the form of images, audio, animation etc. as compared to verbal presentation so that at least students are made to feel the actuality at least. Educational technology, being a powerful tool, can make the teaching learning process interesting and meaningful at school level (Idayavani and Shanthi, 2003). In actual classroom situations, the integration of these technology tools creates a dynamic learning environment where students are active participants in the learning process (Mouli and Saroja, 2003). There are indications that this style of learning results in improved academic achievement, improved attendance, and improved behavior (Mann and Shafer, 1997; 2002). Schacter (1999) analyzed several large-scale studies on the impact and effectiveness of instructional computing and found positive gains in student achievement on researcher constructed tests, standardized tests, and national tests. Studies also suggest that students in technology-infused classrooms are able to perform better in multiple problems and carry out complex reasoning tasks (Hopson et al. 2001-2002). Linn (2003) has given three trajectories to reflect the overall trends in technological advancement in five distinct areas for science viz. science texts and lectures; science discussions and collaboration; data collection and representation; science visualization; and science simulation and modelling. For example, Ryoo and Linn (2012) have mentioned that during a science lesson, dynamic visualisation gave students a more accurate view of unseen, complicated processes than static illustrations.

Despite this widespread belief that use of technology in the classroom is generally good, such may not always be the case. Technology can be used well or poorly, and thus its effectiveness is dependent on how it is being used, by whom and for what purpose. Teachers use varying amounts of technology in their teaching classes. For example, some teachers may utilize presentation slides or similar technology extensively or moderately throughout a course, while others seldom or never use technology. There may be several reasons why teachers ultimately adopt technology for classroom use. For some, it may help them to create better organized, more focused lectures. Others believe

that the use of technology benefits students by engaging them more in the classroom and allowing them to listen more closely without writing down every word that is spoken. Some teachers may choose technology because writing on whiteboards or blackboards hinders their ability to interact with students. Still other teachers may adopt technology as a time saving device because it is readily available today. Although the motivation may differ, theoretically, the overall expectation is that technology will improve the course, engage the students and enable them to learn more.

Furthermore, modern educational trends in our country suggest that using information and communication technologies in teaching various school subjects have helped to attain the educational objectives as set in the curriculum. These technologies have led to the development of tools which have supplemented the teaching learning process in the classrooms and have improved the effectiveness of the teacher (Millen, 2004).

It has been demonstrated that learning occurs more readily if the material is presented visually as compared to verbal presentations of the same material (Laxman and Dharamraja, 2003). It is, therefore, not surprising that educational technologies in forms of audio (Radio, Tape Recorder etc.), visual (Projected; Transparencies, Slides etc. and Non-projected; Charts, Models etc.) and audio-video (Television, Computers and Multimedia systems etc.) have been introduced in actual classroom situations for teaching learning science in our schools (Idayavani and Shanthi, 2003).

1.4 Significance of the Study

After joining as a teacher in an educational institution in Jammu in the year 2002, the investigator observed that in the state of Jammu and Kashmir, the introduction of educational technology and its use in the schools was not up to the mark as compared to some other parts in the country. It was also observed that the school authorities and teachers were rather reluctant to utilize these tools due to lack of training, knowledge and inertia. In the schools, the subject

of General Science (a combination of Physics, Chemistry and Biology) was usually taught by lecture method. Not only this, there was very less emphasis on the use of multimedia to arouse imagination, provide scientific conceptualization and provide up to date information to enrich the knowledge of students. In fact, the use of modern information and communication technologies in promoting science education in school had not entered in the state of Jammu and Kashmir. Only a handful of institutions had been able to introduce educational technology for science teaching.

About the use of technology, it has been well observed that media have little innovation about them if they are considered individually or separately. Hence, for the present research study, the investigator decided to experiment with electronic classroom as an innovation for teaching of general science at secondary level. The main objective was to explore the possibility of integrating different technologies available in the field for the purpose of teaching of science in classroom situations at the secondary level in Indian schools. The main assumption behind such integration was the conviction that a combination of several technologies rather than the use of a single technology would have greater impact on the students' learning general science in the classrooms. Another reason for technology integration happened to be the requirement of the school children and the teachers to have 21st century skills. The most important skill out of these is to know how and when to use technology and choose the most appropriate tool for the task at hand. In the present study, the investigator assessed the effectiveness of integration of technology in teaching learning situations through a well planned approach in form of an electronic classroom for teaching general science at the secondary level. No such experimental study had been conducted or reported in the local school settings.

The present research study can be perceived as significant from different points of view. These are given as under:

1.4.1 From Individual Point of View

Over the last few years, it has been observed that people by and large, are devoting more time in using modern technological gadgets like television, computers and phones. At the same time, schools are increasingly trying to incorporate a variety of technologies to increase the effectiveness of teaching learning process in the classrooms. To make it happen, a lot of experimentation needs to be done for avoiding the misuse or overuse of these valuable technologies which come with high costs. Thus, the scope of present research can be appreciated for both the teachers and students who are the key stakeholders in the process of education and for whom electronic classroom happens to be a new innovation for making teaching and learning more effective. From student's point of view, this study is likely to answer questions related to learning experiences inside a technology-enabled classroom. Important questions regarding the gain in students' achievement as a result of teaching through electronic classroom and change in students' attitudes towards general science are likely to be answered through the present study. From teachers' point of view, this study is likely to empower them with the skills of making their science lessons more interesting, motivating and engaging for the students. Though teachers need to adapt the innovation in a stipulated time limit yet they are certainly to be benefitted with the potentials of the electronic classroom. This study is expected to provide detailed information about this integration. Thus the present study assumes significance from the point of view of both learners and teachers as it enables to enhance the effectiveness of the teaching and learning process upon which the success of the teachers and pupil shall eventually depend.

1.4.2 From Social Point of View

Modern ICT tools have made a strong and constant presence in almost all spheres in human activity. These tools contain the necessary constituents to push the changes that the schools need to introduce to enhance their status on technological advancements. We need scientifically literate and informed people so that they can understand the world and contribute in the development of the nation by becoming good citizen and workers. In modern

day world, schools are expected to be the agencies for transmission and construction of knowledge and for social improvement in ways which enable the students to develop in socially desirable manner. The process of education entails a constant interaction between the teacher and the taught. The students as well as teachers are very much influenced by the social circumstances around them. The teacher, while fulfilling the role of a social engineer, strives to make the students ideal citizens in the context of modern society. Such a society is based upon inculcating progressive outlook and scientific temper among the masses. It is in the perspective of above that one should appreciate the challenges placed on our secondary schools by modern information and communication technologies and guarantee that the new generations take the best advantage of the world of information. The present study by attempting to expose teachers and students to electronic classroom environment is an effort to inculcate scientific values and temper among them and can be described as significant from social angle. This exposure is likely to provide them with the knowledge of usefulness of the tools and resources, which are meant for social development. By integrating technology with the teaching and learning of general science, it can contribute in the building of a socially strong scientific vision among students and teachers in the times to come.

Also, the importance of the field of high order thinking skills like concept formation, modelling, problem solving and scientific procedures is growing rapidly within science education and has opened up new avenues for science education research. Therefore, there is a need to consider research in science education in a wider social context and with particular reference to its potential to enable as many people as possible to play their roles as citizens in scientifically and technologically advanced societies. This requires an understanding not only of scientific knowledge and the associated technical developments, but also of the nature of science and its methods, together with an ability to deploy a range of scientific arguments in wide-ranging public debates that are likely to involve environmental, economic, social and ethical issues.

1.4.3 From Psychological Point of View

A major paradigm shift in instructional methods can no longer rely simply on traditional educational strategies. The speed at which technological changes are taking place is increasing day by day. To meet the demands of the learners of today, one must supplement and/even replace traditional methods of instruction with innovative educational experiences. Technology based multimedia applications are being used as tools to enhance the quality of child's educational experiences by creating more methods to teach children.

A teacher inside a classroom finds a variety of learners that do well with the tried and tested method of direct instruction. However, due to individual differences, a sizable number of students may not learn in this manner and may require additional support involving multimedia inputs. Similarly, a teacher needs to reach all students to create a variety of learning experiences. The first and most simple way is to use technology effectively to supplement classroom instructions so that at least an environment rich with visualization, improved communication and increased possibility of interaction can be created inside a classroom.

It has been proved by researchers that technology helps in meeting the demands of an effective classroom by allowing students to interact with information being provided by trained teachers through the technology enabled environment. There are numerous multimedia programs which have been specially designed to meet the needs of diverse learners in different situations and at different levels. These programmes help them even in understanding the difficult concepts which may usually skipped or left untouched in a traditional set up. In the traditional education set up, one way communication (from teacher to the taught) has always been dominating. This leaves the students somewhat dissatisfied. In the classroom, where technology enriches teaching, learners get more opportunities of participation in teaching learning process and they can visualize facts and details better.

The present study intends to assess the effect of change of teaching strategy on students'/teachers' attitudes, achievement, and students' interpersonal relations with the teachers. The study has been planned to verify the claims made earlier by various researchers in the field of technology in education that when technology is integrated with teaching learning, attitudes of the students and teachers and their interactions undergo a positive change. However, other variables which directly or indirectly influence the integration are also important for the present research. Moreover, a researcher may find the present study helpful in many respects whether it be the study of attitudes, effectiveness or interactions etc. This makes the present study important from psychological angle.

1.4.4 From Technological Point of View

Technology has found its way into our homes and offices and we regularly utilize it for entertainment. After its intrusion in the field of education, technology has also become a very important tool for enhancing the quality of classroom instructions. In its vision, the National Policy on ICT in School Education (2009) by MHRD Govt. of India states “The ICT policy in School Education aims at preparing youth to participate creatively in the establishment, sustenance and growth of a knowledge society leading to all around social economic development of the nation and global competitiveness”. The policy envisages three stages of ICT implementation at school level –ICT literacy and competency enhancement, ICT enabled teaching – learning and introduction of ICT related elective subjects at senior secondary level. The National Curriculum Framework (NCF-NCERT, 2005) has also highlighted the importance of ICT in school education. Also, the Government of India has announced 2010-2020 as the decade of innovation. Reasoning and critical thinking skills are necessary for innovation. The foundation of these skills is laid at school level. It is desirable that affordable ICT tools and techniques should be integrated into classroom instructions right from primary stage so as to enable students develop their requisite skills.

A major paradigm shift is therefore imperative in education. This is characterized by technology enabled instructions, collaborative learning, multidisciplinary problem-solving and promoting critical thinking skills. Modern classrooms are being provided with customized and state of the art hardware and software to be able to make optimum use of information and communication tools like computers, projectors, plasma televisions, liquid crystal display (LCD) systems etc. Similarly, digital sources and multimedia content are increasingly being developed and made available to assist the teachers in their day to day teaching assignments. These multimedia programmes in the form of animations, videos and presentations are to be utilized extensively by teachers to make their teaching more lively, interesting and motivating thereby creating useful and meaningful teaching learning environments. Current technological advancements have also raised a wide debate over their easy integration in the educational context. In these circumstances, it becomes necessary to take initiative to assess the effectiveness of a technology tool like electronic classroom for teaching science. In the present study, the investigator has made an attempt to know what impact does a combination of technologies has on students' attitudes and achievements.

The present research is, therefore, significant as it will go a long way in revalidating the assumption that utilization of technology has a significant role to play in making teaching learning process more effective for students studying general science at secondary level. The deeper we can understand the influence that technology can have on the achievement and attitudes of our students, the more effective use can we make of technology in promoting effective student learning in Indian school conditions. In the present study, the investigator has attempted to create a suitable environment and a modified method of teaching through technology. The results from this research can help educators to make more informed decisions on the tools that we use to enhance student's learning. It would promote further advances in the discipline of educational technology in the times to come.

No educational system can remain untouched from the emergence of innovations and advancements in science and technology. In fact, one of the challenges faced by every educational system is to keep pace with the changes taking place globally and to convert the challenges into opportunities. The system has to approve adequate inputs and investments in not only non human resources but also human resources like educators, researchers and technicians so that quality inputs may be ensured for the creation of a sound system of education. To create technologically competent nation, pertinent facilities of education and training can bring about essential quality (Vision 2020). According to the aims set for such a development, we have to ensure quality in every component of the input, process and the output of the system whether it is educational, industrial, economic, technological and political.

1.4.5 From Educational Point of View

The education system of a nation is meant to serve as a catalyst for multifarious development and advancement. It is a means to achieve many goals set for the progress of the country. One of the important objectives of educational system is development of science and technology at all levels of education - primary, secondary or higher. In India, science education has remained an area which requires to be given importance. It happens to be a major vehicle for enhancing the quality of human life. The developments in science and technology, particularly in information technology and computer science are occurring so fast that it is difficult to imagine the future of education system without their incorporation in educational institutions.

Under such a scenario, it has become important that we should have a strong scientific base among the future citizens in our country. Significant reforms are needed in education to respond to and shape global trends in support of making teaching learning more effective. What is to be learned, how it is to be taught, and how schools need to be organized and transformed to face the challenges of the 21st century. Systemic educational reforms are needed that include reforms in curriculum, pedagogy, teacher trainings, and school

organization. According to new National Educational Policy more and more schools are going to be equipped with technology such as smart boards, computer labs, power point presentation and internet access etc. in coming years. The main purpose of integrating technology in class rooms is to educate students and help them succeed in their academic, vocational and personal goals. Technological innovations are aimed to enhance student's learning skills. For any innovation, educators are faced with a challenge - to implement or not to implement. To keep in touch with the minds of modern learners, educators must embrace the technology of tomorrow. Similar is the case with our science education at the secondary level. Multimedia technology in the classroom simply delivers information to learners in the same way learners already obtain information in real life. Therefore, multimedia technology in the classroom is critical for the educational and personal development of learners. The main purpose of implementing technology is achieved only when the teachers use technology effectively. Unfortunately, if the teachers are not trained to use new tools of technology, they will stick with the old teaching methods. Teacher must be trained to be knowledgeable about technology in order to use it effectively in the classrooms.

Keeping all these points into consideration, the present study assumes importance from academic point of view since it attempts to find answers to questions related to the effectiveness of electronic classroom technique for teaching general science at the secondary school level in our city classroom situations. The research work is likely to be helpful in knowing the status of science education in private urban school settings. This, in terms, shall be significant in improving the teaching learning process mainly the way in which the transaction of science curriculum takes place in our classrooms.

1.4.6 From Research Point of View

Despite differences in their opinions, teachers find common ground in recognizing the role, technology has played and can possibly play in promoting learning. They are also sure that technology will continue to influence the future system of education. Also, teachers and educators have

consistently made various assumptions about the relationship between technology integration and student learning. For instance, it is assumed that students who learn in classes where teachers frequently integrate technology into instruction are likely to exhibit positive perceptions about technology use to enhance their learning outcomes. However, there are different opinions regarding the degree of effectiveness of different technologies used by the teachers in classroom situations.

Science education is itself an independent field of research. The concerns of this research appear to be distinct from the concerns of educational technology. However, these two fields of research have given the researchers an impetus to conduct a study for the improvement of product and process of education. Methods and techniques of teaching were initially borrowed from the sciences but new methods are being developed to suite the learners from time to time. These new technological developments are equally influencing the science curriculum and specifically teaching and learning of science at the school stage.

It can be said that educational technology has emerged as a powerful tool for making the teaching learning process interesting and meaningful at school level (Idayavani & Shanthi, 2003). In actual classroom situations, the integration of these technology tools (Mouli & Saroja, 2003) creates a dynamic learning environment in which students are active participants in the learning process. Research studies have shown that technologies (multimedia and internet) are playing important roles as teaching learning supplements in modern classrooms (Millen, 2003). Further, technology is likely to have the greatest impact on student learning when integrated into curriculum to achieve clear measurable educational objectives (Hawkins, Panush & Spielvogel, 1996). Shelton (1993) also reported researches which indicate that multimedia enhances communication, and that users learn better with multimedia. Given such accounts of why technologies can be seen to have advantages, it is not surprising that the use of computer-mediated technologies in school education would follow a similar pattern. The introduction of computers is often seen as

beneficial, and there is a considerable body of research to support claims that these are advantageous when used properly and effectively. Also, the cost of information technology products and services for educational applications are dropping steadily and are becoming more affordable with respect to other items in the educational budget, thereby increasing their adoption and use in schools (Levin, 1989 & Desai, 1999).

More researches need to be conducted on the aspects like “what are the attitudes of the students and teachers inside of these classrooms when technology is embedded for improving the teaching learning process?”, “what kind of interactions take place between the teacher and the taught?”, and “what is the effectiveness of electronic classroom as a technology in terms of students and teachers’ gains?”.

The present study was undertaken to empirically test these assumptions in Indian school situations. This study is expected to throw light on the extent to which teaching enriched with technology can benefit learners and is capable of conveying scientific knowledge in a superior way as compared to traditional method of teaching. Hence, the present study assumes significance from research point of view.

1.5 Statement of the Study

“A STUDY OF THE EFFECTIVENESS OF ELECTRONIC CLASSROOM FOR TEACHING SCIENCE AT SECONDARY LEVEL IN TERMS OF SELECTED STUDENT AND TEACHER VARIABLES”

1.6 Objectives of the Study

The present study was undertaken with the following objectives:

- i. To study the effectiveness of electronic classroom at secondary school level for teaching general science as compared to conventional classroom teaching.

- ii. To compare the attitudes and achievement levels of students learning general science through conventional teaching and electronic classroom teaching respectively.
- iii. To study the differences in achievement and attitudes of the students on the basis of age, gender and grade when learning general science through conventional teaching and electronic classroom teaching.
- iv. To assess students' perception of their interactions with their teachers teaching in electronic classroom settings.
- v. To study the attitudes of the teachers towards the use of technology while teaching general science at secondary school level.
- vi. To assess the effectiveness of electronic classroom for teaching science at secondary level in terms of perceptions of students.

1.7 Operational Definitions

Effectiveness

Effectiveness was defined in terms of the impact of the electronic classroom technique on the students and teachers for learning and teaching general science at the secondary school level. In the present study, effectiveness was assessed in terms of; variation in achievement and attitudes of students towards general science, teacher pupil interactions, teachers' attitudes towards technology and overall perceptions of students towards electronic classroom teaching.

Electronic Classroom

Electronic Classroom was defined in terms of a technology rich classroom having capabilities for multi-media presentations through computer, television, networking and other supportive technologies. The purpose of electronic classroom was to supplement regular teaching of general science

according to the requirement of a science teacher for making his/her teaching more lively and interactive by utilizing specially developed digital content related to the topic to be taught.

Selected Student Variables

The effectiveness of electronic classroom was assessed in terms of four student related variables in the present study. These variables were;

- a) Students' achievement level in general science (before and after studying through electronic classroom technique).
- b) Students' attitudes towards general science (before and after studying through electronic classroom technique).
- c) Students' perceived effectiveness of electronic classroom technique.
- d) Quality of teacher pupil interaction while studying through electronic classroom.

Selected Teacher Variables

The effectiveness of electronic classroom was also assessed in terms of teacher related variables in the present study. The variable was teachers' attitudes towards technology.

Academic Achievement

Academic achievement was confined to the achievement of students learning general science at secondary level. The index of achievement was taken in terms of the marks obtained in a term test after learning through conventional and electronic classroom methods respectively.

Conventional Method

Conventional method was defined as the traditional lecture method employed by a teacher to teach/explain a topic from science text book to the students

studying at the secondary level (Classes 7th, 8th and 9th). The conventional method consists of usual text books, chalk and talk method with black board as primary teaching aid and including sometimes charts, models etc. but without the involvement of any electronic media for the dissemination of information.

1.8 Hypothesis

Since the study was exploratory in nature, no specific hypotheses were formulated for testing. The electronic classroom being a new conceived strategy in the educational set up which had a very limited scope of creating propositions regarding its effectiveness especially in the Indian schools. Nevertheless, the basic assumption behind the present study was that science teaching through electronic classroom would lead to higher student achievements. Further, this would lead to the formation of more positive attitudes towards science among students and teachers.

1.9 Research Questions

The study was mainly focused on the following research questions

- i. To what extent does achievement level of the group of secondary school students learning general science through electronic classroom technique vary as compared to their achievement level when they learn general science through conventional method?
- ii. Does a change in attitudes towards science take place among secondary school students when these students who are used to learning general science through conventional method are made to learn general science through electronic classroom technique?
- iii. What are the attitudes of teachers towards electronic classroom technique?
- iv. What is the nature of teacher and student interactions in electronic classroom situations?

- v. How do sub-groups of students formed on the basis of age, gender and grade differ from each other in terms of achievement and attitudes while learning general science through electronic classroom technique?
- vi. How do students perceive the overall effectiveness of electronic classroom after learning general science through electronic classroom technique?

1.10 Delimitations of the study

The following were the delimitations of the present study:

- i. The present study being experimental in nature was conducted in one private urban school in Jammu city in the state of Jammu and Kashmir. This school was selected since the basic electronic classroom facilities were already in position and the school authorities had assured to provide full support for the conduct of present research.
- ii. The study was delimited to the teaching of general science at the 7th, 8th and 9th grades. Students studying in 10th grade were excluded in the study since they were busy preparing for their annual Board examinations.
- iii. The present study was delimited to the extent that impact of electronic classroom was measured after teaching two units of content over a period of three months.
- iv. The measurement of achievement was limited to scores obtained on teacher made tests since no standardised test was available pertaining to the content selected for teaching.
- v. The present study was delimited to studying the effectiveness of electronic classroom on students in terms of their achievement, attitudes and perceptions of their interactions with the teachers respectively.
- vi. The present study was delimited to studying the effectiveness of electronic classroom on teachers in terms of their attitudes towards technology.