CHAPTER- I

INTRODUCTION

1.0 GENESIS: Impact of Technologies

“In the current era is of globalization, the large scale use of technologies has narrowed the universe in more ways than one can imagine. For example, the way industries and economies have substantially changed. The speedy transfer of data and information has made possible cross-border cooperation to be more successfully executed, thus facilitating businesses to be run more handsomely and successfully. Outsourcing thus becomes common and as a result new economies such as those of India, China and Brazil have flourished. Technology has contributed and in some cases caused complete shift in the way business used to be operated in past. Creative and critical thinking as well as problem solving skills are now in great demand. There is a great demand of human resource that must be developed; educators are also practicing these new skills in educational settings. The inclusion of information and communication technologies (ICTs) in teaching learning process has revolutionised it and has produced a more educated and skilled knowledge-based work force” (Friedman, 2006).

“The new technologies challenge traditional practices both of teaching and learning and by reorienting how teachers and learners gain access to knowledge have the capacity to transform teaching and learning processes. ICTs provide a variety of powerful tools that may help in converting the ongoing isolated, teacher-dominated and bookish classrooms into attractive, student-dominated interactive knowledge environments” (The UNESCO World Education Report, 1998).

“ICTs are a complete set of technological tools and resources helpful to communicate, and to create, propagate, store and manage knowledge. Communication and information are the soul of the teaching learning process, in formal and non-formal settings, in programmes provided by governmental agencies, public and private educational institutions, profit corporations and non-profit groups, and secular and religious communities” (www.unesco.org).

“A lot has been said regarding the use of film, radio, telephones and television in teaching learning because use of digital tools, applications and networks continues to grow throughout world and media are readily available in digital form, ICT-use in
teaching learning can be expected to increase dramatically. Recent innovations in information and communication technologies (ICTs) have brought new challenges for teaching learning that 21st century means more than basic reading, writing and computer skills in the context of modern life” (C.F. Cuban, 1986; De Korte, 1967).

“The illiterate of 21st century will not be those who cannot read and write, but those who cannot learn, unlearn and relearn.”

In the ongoing situation, this demand of technically skilled youths & professionals are in demand year after year. Technically trained people in the 21st century should know the way of using ICT tools e.g. PC’s, internet and its related technologies, plus audio, video, and other media and multimedia equipments which facilitate masses to work efficiently at workplace and in their day to day lives, using such tools like spread sheets for calculation, budgeting and building scenarios, graphic and multimedia softwares for presentations; data bases for research; and networks for establishing contacts with others.

A common reason that results in the use of ICTs in the classroom has been to train the young generation of learners efficiently for a workplace where ICTs, particularly computers, the internet and other commonly used technologies, are becoming common. Technological efficiency, or the ability to use ICTs effectively and efficiently, is thus seen as a competitive edge in a progressively globalized world of work force.

EnGauge, North Central Regional Educational Laboratory (U.S.) says, “We have framed what we call 21st Century Skills, which include digital age literacy (comprising of functional literacy, visual literacy, scientific literacy, technological literacy, information literacy, cultural literacy and global awareness), innovative thinking, higher level thinking and sound reasoning, effective communication and high productivity. The capacity of ICTs to promote the learning of these skills is related to their use as a tool for establishing educational equity, including promotion of a learner-centered approach”.

Internationally, the worth of using ICTs in teaching learning, especially smart learning, has already been established. It has been completely realised that smart technologies have the capacity to provide more valuable and efficient and effective learning for all, everywhere and all time with all time interactivity, which is not possible with the help of traditional face-to-face class room learning. As a result, learners from
countries who have not adopted ICTs in teaching learning are left behind and as a result serious skill and cognitive difference.

“It is perhaps a wonderful opportunity in the present scenario for us that a technology of potential to enable education for all, everywhere and all time, has become a reality. The process of converging the globe into a global village is something that has brought in a paradigm shift in the way future economies will develop. It is this very quality that requires nations to use ICTs in the everyday lives of their people. The sooner it is done, the better it would be for countries to become part of the global information society. Technology has become a part of nearly everything we do. But does it have a place in the teaching learning process”? (www.csdms.in)

1.1 SMART TECHNOLOGIES IN INDIA

“If I were asked under what sky the human mind has most fully developed some of its choicest gifts, has most deeply pondered on the greatest problems of life, and has found solutions, I should point to India.” Max Muller.

“India accepted the use of smart technologies in teaching learning especially in 1984-85 when the Computer Literacy and Studies in Schools (CLASS) was initially introduced as a pilot project with the launch of BBC micro-computers. A total of 12,000 such computers were provided to secondary and senior secondary schools with the help State Governments. Later on the project was adopted as a Centrally Sponsored Scheme during the 8th plan (1993-98) and was broadened to provide financial grants to institutions which were given BBC Micros and also to cover new Government Aided Sec. /Sr. Sec. Schools. Financial grants included annual maintenance grant for BBC micros and purchase as well as maintenance of equipments for new schools” (www.mhrd.gov.in).

“2598 schools having BBC Micros were included in the CLASS scheme during the 8th plan for providing teachers, maintenance of hardware, consumables and textbooks for students and training of teachers in schools. In addition, 2371 schools were covered with new hardware and services which included Rs.1.00 lakh for hardware configuration and Rs.1.30 lakh annually for recurring costs. Rs.0.80 lakh per annum was kept as the recurring costs for schools which had already been covered under the BBC-Micros scheme” (www.mhrd.gov.in).
“NIC was entrusted with the responsibility as the nodal agency for finalizing the contract for the supply of hardware. The use and supply of software was limited, availability was limited to Sr. Secondary Schools and the students of class XI and XII had to undergo a Computer Course Module. National Task Force on Information Technology and Software Development (IT Task Force) constituted by the Prime Minister in July, 1998 made particular recommendations on introduction of I.T. in the education sector including schools, such as:

- Vidyarthi Computer Scheme, Shikshak Computer Scheme and School Computer Scheme to enable students, teachers or schools respectively, desirous of buying computers to do so under attractive financial packages. These schemes will be supported by a suite of initiatives such as lowering the cost of PCs, easy installment bank loans, computer donations by IT companies and other business houses, bulk donations of computers by NRI organizations, large volume bargain price imports, multi-lateral funding, etc.

- Computers and internet shall be made within the reach of schools, polytechnics colleges, and public hospitals in the country by the year 2003.

The concept of SMART schools with emphasis on Information technology and use of skills and values considered important, in the next millennium, gained momentum to be started on a pilot demonstrative basis in each state, with the provision of Computer Systems to all educational institutions up to Higher Secondary/ Secondary Schools by proper investments (about 1-3%) of the total budget during the next five years, as per recommendations of the Task Force” (www.mhrd.gov.in).

“A centrally sponsored scheme, Information and Communication Technology (ICT) in School, was launched, in December 2004, to provide opportunities to secondary state students to develop ICT skills and for ICT-aided learning process as a major accelerator to fulfill the digital gap amongst students of various socio-economic and other geographical barriers. The scheme provided support to State/UTs to constitute computer Labs on a sustainable basis and aimed at setting up SMART schools in Kendriya Vidyalaya and Navodaya Vidyalayas to act as: Technology Demonstrators and to lead in transferring ICT skills among students of neighbourhood schools” (www.mhrd.gov.in).
“The scheme is currently being implemented both in Government and Government aided secondary and higher schools. Support is provided for purchase of computers and hard wares, educational software, training of teachers, internet connectivity etc. The financial help is provided to state and other institutions on the basis of the approvals accorded by Project Monitoring and Evaluation Group (PM & EG) headed by Secretary of the Department of School Education and Literacy, MHRD. With main focus on computer literacy programme, the scheme addresses to act as teaching and learning aid to make classroom learning more interesting and interactive. The emphasis is also being laid on self-learning aspect through initiatives like Gyan Darshan launched in January, 2000, with three completely digital and round the clock TV channels dedicated to education; Gyan Vani an FM radio channel was launched, In November 2001, with different FM stations in the country (GOI Ministry of HRD Press Release, Oct 21, 2003) (www.mhrd.gov.in).”

Among other initiatives, mention needs be made of the following key notes:

- NCERT came up with National Curriculum Framework for school education in the year 2000 to provide availability of global information resources on priority basis (NCERT website), besides other mentioned goals like:
  - New plans were made to include computers in educational curriculum; and
  - A framework was made available to provide learning opportunities with the help of smart technologies across the curriculum.

In addition to above mentioned goals, in 2006, NCERT ensured the availability of PDF copies of all its textbooks from Class I to Class XII on its website. (NCERT website).

National council for teacher education (NCTE) took a landmark decision in the year 2000 to make ICT literacy an essential part of pre-service teacher education courses, producing and supplying a series of CD ROMS on, ‘IT Literacy’ to all teacher education institution in the country and providing on-campus orientation of teacher educators in the workshop mode and in turn to produce every year over 2,50,000 teacher trainees conversant with ICT pedagogy to help improve quality of teacher education and through it the quality of teachers at different levels of schooling. It uploaded all its major publications on its website.
• Government of India launched a project named Vidya Vahini in 2002, to provide ICT and ICT equipped education in 60,000 schools in India in next three years, and provided a budget of Rs. 6,000 crore. Started with a pilot project covering 150 schools, the Government planned to provide a computer lab connected with internet, intranet and television for video-conferencing facility, web-broadcasting and e-learning in every school.

• EDUSAT, India’s first dedicated education satellite, was launched at a cost of USD 20 million in September 2004.

• The Government of India, Ministry of HRD, Department of Secondary and Higher Education issued an order on May 20, 2006, for the Broadband connectivity in all the secondary schools during the 11th Panchyavasi Yojana, considered as ‘National Educational Plan’ by the Prime Minister with an allotment of over 19% of the total budgetary provisions for this new thrust area lay emphasis in secondary education, supporting out its mid-term review suggestion to universalize secondary education on lines of the Sarva Shiksha Abhiyan, with a budget permission of Rs. 411 billion to establish ICT labs for computer enabled learning and Edusat Centers for distance education learning.

• At global level, the United Nations too have started their “Global School and Communities initiative” (GeSci), a special programme to boost the use of smart technology in the educational field from their Bangalore base in collaboration with the Indian Ministries of Information Technology and Education, facilitating Policy Support, technical assistance and global resources for the initiative.

• An additional support of Public-Private Partnership (PPP) initiatives, State Governments and big private sector organizations and multinationals too have come up to promote computer enabled education to the people in their respective ways such as

• ‘Head Start: Computer-Assisted Education in Madhya Pradesh’, one of the largest computer enabled education programmes initiated in 2000 by the Rajiv Gandhi Shiksha Mission (RGSM) of Madhya Pradesh Government started its largest computer, fundamentally aiming at improving the quality of classroom learning through the use of computers in the primary and middle schools. Launched as a
pilot project in about 648 schools, it later expanded to over 2,718 rural schools across the state at the elementary level.

- The Intel® Teach Program Launched in February 2000 in India in the cities of Delhi, Bangalore and Mumbai has impacted over one million teachers all over country both in In-service and Pre-service segments within a span of nine years. 
  "With the help of technology(in India) India teachers will be leaders in the transformation of education around the world." – Craig R. Barrett Chairman, Intel Corporation.

  “Shiksha India (December 2001), a non-profitable organization set up by the Confederation of Indian Industries (CII), has created a teacher’s portal using open source tools and technologies (Shiksha India Website)”.  

- “Edu Reach (ICT) Educomp, with a record of implementing large scale PPP projects, in partnership with thirteen (13) State Governments, namely, Government of Assam, Karnataka, Orissa, Tripura, Gujarat, Uttar Pradesh, West Bengal, Delhi, Haryana, Jharkhand, Rajasthan, Chattisgarh and Andhra Pradesh covering more than 12000 government schools and benefiting 5.5 million students studying in government schools in India, has as its main objective, to equip each student teacher with technology - based educational skills so that teaching and learning can be more interactive and interesting.

- An initiative towards the use of ICT in Non-Formal Education includes computer Based Functional Literacy Program (2004) of Tata Consultancy Services in Andhra Pradesh, Tamil Nadu, Madhya Pradesh, Maharashtra, Utter Pradesh and West Bengal (Tata Literacy Programme Website).

- Hole-in-the Wall training system (2002-2003) developed by NIIT is yet another enterprise involving international finance co-operation, a world bank subsidiary which has invested $ 1.6 million for computer kiosks in more than 60 locations to enable underprivileged children in India to learn from web-based curriculum (UNESCO Website).

- With a substantially increased provision for the scheme Mission in Education through ICT to Rs.900 crore in the Union Budget for 2009-10, India has the demographic advantage of a large percentage of young population being modified
into dynamic economic units enjoying the right to education and ICT skills” (www.mhrd.gov.in).

1.2 Student Curiosity and its Effects on Learning

Syracuse University School of Information Studies conducted a research investigating curiosity and the role it plays in student learning directly affecting motivation, engagement, and interest. The study suggests researchers to find new ways to study and develop curiosity through the use of information technologies.

“If parents and educators do not recognize the role of curiosity in both informal and formal learning environments, how will they know when curiosity has the potential to enhance a learning experience versus when it may actually distract from learning” (Arnone, 2011 p. 184)?

Arnone states that not sufficient current research exists on the role curiosity plays on learning. There is a history of research that was done in the 1950’s up through years until the 1980’s, but this research is much before the large scale use of computer technologies in classrooms. Studies from Berlyne, Beswick, Tallmadge, White, Deci, and Piaget are all post dated 1970s or later. The only studies 1980 or newer mentioned by Arnone are from Reio et al, Litman and Jimerson, Tapscott, Palfrey and Gasser. These newer studies investigate the structure of curiosity deeper; attempting to find out causes. Alessi (2001), mentions motivational studies done by Leeper and Malone in the 1980’s and makes a differentiation between sensory and cognitive curiosity. “Sensory curiosity is stirred by ocular or auditory effects that are surprising or attractive attention. Cognitive curiosity is aroused by information that conflicts with the learner’s present knowledge or expectation, is contradictory, or is in some way incomplete. These situations motivate the learner to search for new information that rectifies the conflict” (Alessi, 2001 p. 25).

Arnone gives a different definition of curiosity as “a desire for new information or experience afforded by new media environments and includes a trigger or multi-trigger scenario evoked by dynamic media environments” (p. 185).

“The desire starts a reaction and a resolution (satisfied or non-satisfied). If the learner is satisfied, new learning will take place; further increasing student interest. Arnone argues that curiosity is affected by personal, situational, and contextual factors.
Examples of personal factors are the learner’s own motivation, competence, developmental differences, and cognitive abilities. Situational factors refer to the in-the-moment factors which tempt curiosity such as personality, predispositions, emotions, etc. Contextual factors are the setting factors such as a classroom, or online learning environment which would influence the curiosity” (Arnone, 2011).

1.3 Smart Technologies and Student Learning

“Used effectively, technology can play a role in exhilarating curiosity and interest and in facilitating and holding up purposeful engagement. Moreover, technology can play a role in triggering and addressing personal, situational, and contextual factors that support autonomy and competence and enhance active, deep learning” (Arnone, 2011 p. 182).

Smart technologies are being used because they are said to “enhance learning” by arousing student “interest” through “active participation” (Smart Technologies). Theoretically, we should be able to see how Smart Board affects all three forms of engagement (affective, participative, and cognitive) since student interest does not fully develop until at the highest level of engagement according to Arnone’s model. Since Smart Board claims to increase student participation, there is the possibility that it even increases student interests through the affective and participative domain.

A common finding is that Smart technologies motivate students to learn through active participation and engagement. Motivation is hard to measure but is categorized as either being intrinsic or extrinsic according to Malone’s Motivation Theory (Alessi, 2001, p. 26).

Extrinsic motivation may help to explain the reasons for affective and participative engagement. There is usually some external source (reward) that encourages the learner to participate. Extrinsic motivational tactics are said to be the least affective because the rewards become the focal point of the learner’s interests rather than the learning content. (Alessi, 2001, p. 26). However, they may be the best way to get students engaged that normally wouldn’t be.

In contrast, intrinsic motivation is highly effective and described as rewards that “come from within the person” (Alessi & Trollip, 2001, p. 25). This is the cognitive
engagement that occurs when the learner has developed self-interest in the learning content and therefore finds satisfaction investigating the content deeper. There are four primary elements that further motivate intrinsic learners: challenge, curiosity, control and fantasy (Alessi & Trollip, 2001, p. 25).

“The more a program includes these four elements, the more successful learning is because people enjoy it more” (Alessi & Trollip, 2001, p. 25).

Smart technology is said to be “interactive,” but what defines interactivity? Dictionary.com defines interactivity as the state of allowing continuous two-way transfer of information. Research shows that students’ best learn while interacting with others and when technology further promotes those interactions (Wong, 2008). It also suggests that students learn the fastest through direct instruction from the teacher (Ruutmann, 2011). Therefore, the role of the teacher cannot be interchanged with the technology, but if the technology allows for better transformation of information, we can argue that learning should still be improved. However, Arnome (2010) states that information technology “can also overwhelm and distract by providing more information than can be organized and processed to determine relevance.” This is also known as information overload.

Smart technologies claim that they help enable students and teachers by saving time organizing information visually through the manipulation features. The technology also helps “create meaning, making connections, and develop understanding” (Smart Technologies). Giles (2011) also claims that Smart technologies “helps bridge the difference between learning styles, abilities, prior knowledge, and interest levels that exist within any group of children.” Part of this may be explained by the fact that students view the latest relevant technologies.

“Students see the use of relevancy based digital tools, content and resources as a key to drive learning productivity” (Arnone, 2011 p. 193).

“Teaching and learning in the 21st century should be marked different from earlier times, as teaching and learning are now occurring in an increasingly online world. Traditionally, learning environments were restricted to face-to-face delivery or where distance education was undertaken, delivery was largely characterized by the posting of printed resources and communication were often slow and awkward. Integrating technology into teaching-learning transaction has been found transforming the teacher’s
role from being the traditional ‘Sage on the Stage’ to also being a ‘Guide on the side,’ and students’ roles also change from being passive receivers of content to being more active participants and partners in the learning process” (Alley, 1996; Repp, 1996; Roblyer, Edwards and Havriluk, 1997).

“ICTs offer great potentials and advantages in boosting students’ learning. First, information and communication technologies offer a constructivist approach to learning through the provision of interactive learning experiences. Second, learning through ICTs is more effective as they provide opportunities for using multiple technologies (Video, Computer, Telecommunication, etc.), thereby providing visualization aids in the internationalization and understanding of difficult concepts and processes. This gives opportunities for providing links between theory and practice. Third, ICTs provide opportunities for students to gain valuable computer skills which are related to today’s job market. ICTs also provide students with repertoire of resources to enhance learning. Students have access to current and up-to-minute information; with ease students can revise and update learning resources available to them” (Lopez, 2003).

“The use of ICT in education can improve memory retention, increase motivation and generally deepen understanding” (Dede, 1998).

“ICT can improve the quality of education because multimedia contents help to illustrate and explain difficult concepts in ways that were previously inaccessible through traditional teaching resources and methodologies” (Selinger, 2004).

**Why to Evoke Curiosity in a Classroom?**

There are many reasons why an educator would want to evoke curiosity in a classroom. Students that become curious develop an interest in the learning material. Once student interest is captured students are more likely to be involved and fully engaged; further helping to establish a learning environment with less behavior problems (Arnone, 2011) which in turn minimise distractions.

Studies have suggested that varying between curiosity questions and the phases of interest can lead to better student engagement and deeper levels of learning (Arnone, 2011). As an educator, one of the goals we are taught is to strive to make students
progress to higher levels of thinking and apply that knowledge to create and evaluate content.
The goal is to increase student engagement and continually challenge them. Engagement can occur in three forms: participative, affective, and cognitive. A participative engagement example would be caused by an imposed goal (by a parent or teacher) but have little impact on a student’s interest to learn. For example, if a student is told that he/she cannot attend a school function unless a certain grade is attained, the student would participate, but only to attend the school function. It may not mean that the student is interested in the content. An affective engagement occurs because the learner finds the learning to be pleasurable and fulfilling. Activities and games are an attempt to make learning more fun for students and an example of affective engagement. A cognitive engagement occurs when the learner is intrinsically interested and committed to learning the content (Arnone, 2011). This would be the highest level of engagement, and helps us identify the meaning of student interest.

Arnone argues that in order to understand the impacts that technologies have on student learning, we must first better understand the role and meaning of curiosity and engagement. Only then we can accurately evaluate the effects technology has on learning. Arnone states that “once curiosity is ignited and interest is piqued, certain technologies may help students focus their curiosity inspired learning through goal setting and planning” (p.191).

1.4 Role of Smart Technologies in Instruction of Specific Content Areas / Skills

Van Daal et al. (2000) demonstrated, “Kindergarten children, given a reading and spelling program, dramatically improved their performance, relative to peers not given access to the same program”. Similar positive results are reported by Nixon-Ponder (1999).

“A National Survey of teachers was conducted and concluded that teachers report improvement in children’s writing as a result of the use of a computerized programme” (Becker, 2000). Sadiah (2003) and Sharifah et al. (2001) “found that students provided with animated mode of lesson presentation using power point not only improved students’ performance but also enhanced their interest in learning biology”. Hennessy et al. (2001) “too reported a positive effect of ICT on the students’ interest in biology”.
“The developed software in Chemistry for standard XI science students was found to be effective in terms of academic achievement of the students. The students and teachers were found to have favourable opinion towards the software package” (Anjali Khir Wadkar, 1999). “The use of computer technology and graphing instruments in a weather project increased student motivation, enjoyment and understanding of graphing technique (Hennessy, 2000).”

Koetter et al. (1990) found, “through systematic evaluation that, although the use of computers to teach geography concept was viable, the 5th grades students responded most positively and performed best with live instruction”. Yusuf (1994) found, “7th and 8th graders had a significantly deeper understanding of Fundamental geography concepts with computerized instruction than that of the control group”.

Munther Mohammed Zyoud, (1999) found, “the 8th standard students were found to have negative attitude towards computer assisted English language instruction. When the computer is used to its full potential, it can help the students achieve more in learning vocabulary, grammar and comprehension to the learners with different IQ, motivation and attitude”.

Indubala U. Singh, (1999) developed video-instructional package for the students of IX class and found significantly effective in imparting knowledge related to environmental education. Yu (1998) used teaching supported by a personal computer and found improvement of students’ performance and their attitudes to natural sciences. Venezky et al. (2002) reported, “technology, especially on the www, can be a catalyst for improving and innovating in education, but whereas transformative vision and inspiration-led technology serves only as an additional resource and not as a catalyst”.

1.5 Role of Smart Technologies in Schools

Discussing about the present state of teaching learning nearly one hundred years ago, Dewey (2001) noted:

“From the view point of the child, the great waste in school may come from his inability to utilize the experience he gets outside…while on the other hand, he is unable to apply in daily life what he is learning in school. This is the isolation of the school – its isolation from life”.
“Now a day, there is a great change in schools, of which much can be credited to technological advances occurring in our world today, including access to an abundance of information, and advances in computers, the internet, communications and networking. A New York author gave the term digital native to refer to these new learners born into a world of technology and they think and act differently than students in the past who grew up without technology” (Prensky, 2001).

Start of technology can be seen as the driving force in development and education is promoted as a means to change from an industrial age to an emergent information age. Schools are under pressure to provide access to the educational technology as quickly as possible (Cuban et al., 2001). School is the core of learning and epicenter for development of any society and nation. The secondary schools in India work in a variety of academic and social contexts. Equipping institutions with smart technologies promises a high return on investment as Information Communication Technology (ICT) is the faster growing field in India. Secondary education is a deciding stage in the educational hierarchy as it prepares the students for higher education and also for the world of work. McFarlane (1999) studied, “the introduction of integrated learning system (ILS) into schools found improved teacher attitudes and use of computers. Technology is most influential when incorporated with curriculum and assessment. It can have the greatest impact when unified with curriculum to attain clear and measurable educational objectives. Unification of technology with curriculum and professional growth enhances students’ achievement. Significant student achievement gains for technology integrated with standards were demonstrated by an eight year longitudinal study of SAT1, performance at New Hampshire’s Brewster Academy. Students participating in the technology unified with school reform efforts (School design model) demonstrated average increases of 94 points in combined SAT1 performance over students who participated in the traditional independent school experience”.

“Information and Communication Technologies (ICTs) have had significant impact on the traditional school system. They have provided modern opportunities for teaching and learning, and they have engendered advances in research about how people learn, thereby bringing about rethinking in the structure of education” (Lopez, 2003).
“With the liberalization and globalization of Indian economy, the rapid change witnessed in scientific and technological world and the general need to improve the quality of life and to eradicate poverty, it is important that the school leavers acquire a higher level of knowledge and skills than what they are provided at elementary level. It is also necessary for improvement of vocational knowledge and skills at the senior secondary level to enable some students to be employable” (www.dietthriissur.org).

The presence of computers and internet availability enhances ICT education and skills, better preparing the new generations to exchange in the information society. In developing countries, the schools represent ideal access points because they cover large part of the population.

Dimmock (2002) insists, “Many of the changes that occurred in education around the globe in the 1990 have occurred at levels beyond the classroom and the day-today experiences of learners. At the turn of the millennium, he argues for a redefinition of the process and principles of changing school environment, for a more sophisticated understanding is required of the complex interconnections and contexts that constitute school cultures. Learning environments in schools typically involve one or more adult teachers connected with a number of students, usually in well defined physical settings”. These people interact and form a variety of relationships, creating what Salomon (1994) calls “a system of interrelated factors that jointly affect learning in interaction with (but separately from) relevant individual and cultural differences” (p, 80) this is what Wubbels, et al. (1991) term the “relationship dimension in learning environments at school. The learning environment has a physical as well as a relationship dimension. Physically it may be in a room, full of particular furniture and equipment. Curriculum materials such as books and videotapes may also be present. The curriculum also has a place in the relationship dimension of the environment in that the students and teacher(s) are focused on certain processes and content in the curriculum and have a relationship with that curriculum and the methodologies that are associated with conveying the curriculum”.

“Most experts in the field of educational computing would characterize smart technologies as interactive and thus consider them a place within the relationship
structures of the classroom learning environment, not just the physical environment” (Lynch, 1990; Olson, 1988; Rieber, 1994).

“The potential uses of the smart technologies are: (a) tutor, computer assisted instruction in which the computer teaches the child; (b) tool, in which the computer amplifies to address academic tasks; and (c) tutee, in which students learn by programming (tutoring) the computer. There is a general consensus that the use of ICT in teaching and learning brings about positive benefits in student learning. The findings of the impact T2 Survey” (Taylor, 1980). (Harrison et al., 2002) provides firm evidence of ICT having an impact on teaching and learning in the classroom.

“The practitioners from 26 countries were asked what were the main material and non-material obstacles for ICT implementation. Ten most commonly cited obstacles were: insufficient number of computers, teachers’ lack of knowledge/skills, difficult to integrate in instruction, scheduling computer time, insufficient peripherals, not enough copies of software, insufficient teacher time, not enough simultaneous access, not enough supervision staff and lack of technical assistance” (Pelgrum, 2001).

“Change in school structure occurred in correspondence with transformations in the social and economic environment within which the school is inscribed and operates. Success in implementing this change requires a certain degree of vision and willingness to ‘learn’ and embrace change, a term coined by Parpert (1993). Nowadays, as ICT has a fundamental impact on our lives, it is only natural to anticipate that the implementation of ICT in school will affect its grammar and lead to fundamental transformations in its structure” (Watson, 2001). “In the recent years, an increasing number of countries have been endorsing ICT implementation as part of their national education policy, including aspects such as installation of computer infrastructure in schools, connecting computers to the internet, and teacher training. Special attention has been given to diffusion of innovative ICT practices as an ongoing process in several aspects of school life, such as curriculum, teaching and learning processes, timetables and planning of learning space” (Pelgrum and Anderson, 1999; Venezky and Davis, 2002).

“Schools around the world perceive integration of ICT into teaching and learning as a challenge, aimed to promote considerable change within the school structure as a whole, or as a lever for local change within one or more of its components, e.g., creation
of new learning configurations, formation of novel curricular solutions, broadening and alteration of teachers’ traditional roles, generation of novel educational settings. ICT in schools has reduced modification in teachers’ role, from instruction to guidance, assisting students in search of individual learning methods and evaluation of their learning processes and outcomes; and in students’ role, e.g., becoming active learners engaged in collaborative, authentic learning within the community content” (Kozma et al., 2003).

“An educational innovation can be regarded as a shift in educational paradigm. Schools assume the role of being the primary agents for preparing students to function in and became an integral part of the information society” (Pelgrum et al. 1997). “This paradigm shift is oriented towards lifelong learning; schools’ main goal, accordingly, is to supply skills and competencies required for living and working in a continuously changing world” (Fisher, 2000). “ICT serves as a driving force behind the design, establishment and evolving of this paradigm shift, affecting both contents (new technology-related concepts and skills included in the curriculum, re-arranging of the curriculum) and general skills (e.g., learning how to learn, acquiring generic knowledge manipulation skills and teamwork skills). Technology based innovations may facilitate transition from tradition to emerging pedagogical paradigms, leading to novel approaches to instruction in a number of dimensions constituting the school milieu, including the curriculum, time configuration, teacher and student practices and roles, grouping and collaboration” (Means et al. 1993). Hence, “the people included in the social milieu are of the utmost importance when referring to integrating innovations in schools, the social system refers to the group or groups of people among whom an innovation diffuses within their settings” (Rogers, 1995).

“Diffusion is the process by which an innovation is communicated through several channels over time, among members of a social system. Rogers provides insight, through his ‘diffusion of innovation theory’, regarding diffusion patterns of innovative initiatives within schools. He defines this process as containing four components:

a) Diffusion in the process by which an innovation is communicated through several channels over time, among members of a social system

b) The innovation in itself: an idea, practice, or object that is perceived as novel by an individual or a group of individuals;
c) Communication channels: the means by which communication passes from one individual to another; and
d) Time: includes the decision process regarding the innovation, the adoption time by an individual and/or the group, and the adoption rate of the innovation” (Rogers, 1995).

1.6 Smart Technology and the Teacher

According to Fullan (1991), “Educational change depends on what teachers do and think. It is as simple and as complex at that.”

“In classrooms today, the role of the teacher needs to change from the traditional role of prescriptor to that of orchestrator of learning – which necessitates the designing of ICT integrated classrooms promoting higher order cognitive skills” (Fullan, 1991).

“Teachers are rich resources in the implementation of any innovation, for they bring with them rich practical know-how of the classroom, for example, the Japanese lesson study approach has shown that classroom-based material developed jointly by teachers and external consultants provide resources that can be practically used in the mathematics lessons” (Isoda, et al. 2007).

“Teaching is becoming one of the most challenging professions in our society where knowledge is expanding rapidly and much of it is available to students as well as teachers at the same time” (Perraton et. al. 2001). “As new concepts of learning have evolved, teachers are expected to facilitate learning and make it meaningful to individual learners rather than just to provide knowledge and skills. Modern developments of innovative technologies have provided new possibilities to teaching profession, but at the same time, have placed more demands on teachers to learn how to use these new technologies in their teaching” (Robinson and Latchem, 2003).

“ICT has highlighted some significant changes in the teacher’s role:
- Change in relationship with pupils.
- Change in role of facilitators and managers who support learning.
- Change in the content and scope of teaching.
- Changing Locus of control from teachers to learner
- ICT do not meet the task to the attachment or supplement to teachers preparation, but they offer the infinite access to information which is accessible without effort due to internet” (Gilmore, 1995).

“Although today, access to new technology is provided in most schools, the process of technology integration into every day teaching is still very low, and the full potential of computers and software for mathematics teaching and learning is far from being tapped. Among the various reasons for this phenomenon, NCTM (2000, p 25) expressed probably the most crucial concerns of in principles and standards for school mathematics:

The effective use of technology in the mathematics classroom depends on the teacher. Technology is not a panacea. As with any teaching tool, it can be used well or poorly. Teachers should use technology to enhance their students’ learning opportunities by selecting or creating mathematical tasks that take advantage of what technology can do effectively and well-graphing, visualizing and computing” (Cuban et al., 2001, p.815).

“On examining the teacher’s role in classrooms with computers and argued that teachers need to teach the process of learning rather than its products. The conventional learning skills such as locating, collating and summarizing information and identifying connections and contradictions within a body of information, all need to be explicitly moved to the centre of the curriculum. The developments of such skills need to be supported using appropriate forms of software. This requires the explicit teaching of ways of organizing cooperative activities involving computers whether in face-to-face groups around a single machine or through cooperation at a distance via conferencing or email” (Scrimshaw, 1997).

“Integration of technology in classrooms can significantly transform teaching and learning. New technologies offer new ways of dealing with traditional content in many mathematical areas” (Pedretti et al., 1999).

“Teachers are the key to whether technology is used appropriately and effectively and technology increases conversation, sharing and learning among students and between students and teachers. Technology Aided Learning (TAL) takes students to higher level of thinking/processing and enables them to become self-learners with the convergence of technologies – the computer, CD-ROMs, video and web- conferencing,
internet, broadband and television, to make, it possible for cradle to grave learning to become a reality. The digital world today enables children to learn anything from mathematics to music from teachers across the country and the globe. Numerous results of studies into the impact of ICT on students’ learning have provided convincing evidence of its positive impact on learning gains (cf. Watson, 1993; Liao, Cox and Abbott, 2004) and students’ motivation” (Gardner et al., 1993; Cox, 1997).

A digitally smart society requires smart teachers who are “Digital Literate” Teachers must be multi-skilled in order to manage the multi-skill demands of a curriculum. Information and communication technology as a learning tool has enormous potentials. There is enough scope for learning to dynamically interact and collaborate with content, teachers learning resources to construct their own meaning.

In the ongoing age of science and technology, the traditional teaching practices are not adequate enough to arouse interest among the students nor do they fulfill intellectual, psychological and emotional needs to the learners in the new millennium.

“Traditional methods of imparting knowledge such as lectures, books and conference papers are characterized by a linear progression of information. Human minds are more adaptable than this; using non-linear strategies for problem solving, representation and storage and retrieval of information” (Collins and Quillian, 1969; Collins and Loflus, 1975). “Hypertext software enables teachers to provide them students with the non-linear means to match non-linear thinking processes” (Semenov, 2000).

“Computer tools can help students or teachers to manipulate complex data sets and help develop mathematical understanding” (Cobb and McClain, 2002) “tools can help learners to picture scientific ideas or to develop conceptual understanding” (Jonassen, 2000).

“ICT use by pupils and teachers in the case study schools led to positive motivational outcomes, supporting a focus upon learning and tackling of learning task. Technology environments allow teachers to adapt their instruction and teaching methods more effectively to their students’ need. By integrating educational tools into their everyday teaching practice, they can provide creative opportunities for supporting Students Learning and Fostering the acquisition of mathematical knowledge and skills” (Don Passey et al.2004).
“ICT changes rapidly and new innovations offer new possibilities for teaching and learning these not only open up new technologies to influence the existing curriculum more effectively or more efficiently but change the nature of that curriculum by altering the content of what needs to be taught, such as in the area of digital literacy with use of electronic texts or the progression of how a topic like algebra can best be taught in mathematics” (www.learning.wales.gov.uk).

“The teachers who are already regular users of ICT have confidence in using ICT; perceive it to be useful for their personal work and for their teaching and plan to extend their use further in the future. The factors that were found to be most important to teaching were: making the lessons more interesting, easier, more fun for them and their pupils, more motivating for the pupils, and more enjoyable” (Cox et al., 1999). Similarly, “those teachers who are motivated and have strong commitments to their pupils learning and their own professional development will evidently integrate computers more easily within their teaching” (Moseley et al., 1999). “He further found that teachers who successfully use technology in the classroom have positive attitudes to ICT and focus on pupil choice and individual study rather than teacher direction. The range of software that is available for subject teachers also encourages some teachers to take ICT” (Goodwyn et al., 1997; Scrimshaw, 1997).

“New technologies offer new ways of dealing with traditional content in many mathematical areas” (Holenwarter, 2006a, p.5).

“Whenever technology is used for teaching mathematics, it is the responsibility of the teacher to decide when technology can effectively improve learning opportunities and which kind of technology is appropriate to reach objectives of the lesson” (Lawless and Pellegrino, 2007, p.581). Accordingly “Technology should be used widely and responsibly, with the goal of enriching students’ learning of mathematics” (NCTM, 2000, p.24).

“Since technology allows for more student-centered approaches including active learning, mathematical experiments, or discovery learning, usually the role of a teacher needs to transform from being instructor to being a coach or mentor for students” (Bruner, 1961).
“The level of technology used by the teacher significantly affected student academic achievement in mathematics in a comparison of fourth and fifth grade teachers and their students. Students whose teachers were high level users of technology in the classroom scored significantly better than did students whose teachers were low level users of technology in the classroom. Teachers who were high level of users were differentiated from teachers who were low level users in terms of frequency and extent of use of computers with students, instructional methods used with technology, and perception of influence technology on student learning and behavior” (www.iitg.ernet.in).

“The information and knowledge society provokes a continuous change in the role and mission of teachers. Being a teacher in the knowledge society requires new specific competences; a teacher has to deal with new knowledge and new ways of assessing knowledge, a teacher has to deal with a networked world and with new type of cooperation and collaboration, a teacher has to deal with a society in which knowledge plays a crucial role, a teacher has to deal with lifelong learning. The networked knowledge society results in teacher working in a more collaborative way, not only locally in their school, but regionally, nationally and also globally. The teaching Profession, therefore, needs to evolve strongly and quickly. Clearly, it appears that teachers are the key agents in the education system and are instrumental in the revolution of education” (www.site.aace.org).

1.7 Educomp Smartclass

“Educomp Smartclass, is a technology solution within the classroom that has revolutionized teaching and learning, across over 10,000 schools, reaching out to millions of students. Using mapped to curriculum 2D-3D digital content across all school subjects it has, (as testified by a Dun and Bradstreet research) paved the way for vastly improved teaching learning outcomes. For learners it has meant aroused interest levels, more engagement, and yes better comprehension of critical concepts. For teachers it has meant ease of facilitation and superior teaching outcomes. It’s a unique solution, with four interlocked components:

1) Content- Educomp smartclass ‘Class transformation System (CTS)’ is arguably the most versatile application that covers every aspect of the teaching learning process. Over
half a million teachers have been benefitting from its meticulously mapped to curriculum instructor led Digital Content. CTS is also equipped with highly effective facilitation tools including, Teaching Ideas, MCQ bases Assessments, Diagram Maker, Mind-Maps, Simulations, Worksheets, Topic Synopsis and a vast directory of topic relevant weblinks.

2) Technology – ‘Digital Teaching System(DTS)’ is a proprietary hardware with built-in computing, interactivity, power back-up, stereo speakers and a Document camera. DTS is designed keeping stringent conditions of classrooms in mind.

3) Academic Support – A dedicated ‘Academic Support Group (ASG)’, ensures that schools adopting Educomp smartclass are able to make a smooth transition to the digital learning environment. Teachers are trained to handle hardware and structure lesson plans around digital content. Vriti, set of processes, ensures optimal use of Smartclass.

4) Affordability -For mass adoption model, Educomp offers smartclass at affordable monthly installments to schools” (www.eletsonline.com).

**Why to Start the Programme/Project/Initiative:**

“The perennial tug of war between teacher’s challenge to explain and students’ struggle to understand inspired us to take the journey of discovering new concepts. It was a paradigm shift to undertake what no one had thought of before: bring technology into classroom. The result was the Educomp smartclass enabled classroom. It changed forever, the way teachers taught and students learnt. It allowed teachers to complement traditional teaching with an exhaustive repository of mapped to curriculum 2D and 3D digital modules which she could access in a classroom and project on the whiteboard, to elucidate, explain critical concepts, across virtually all subjects. Outcome was nothing short of amazing. Classrooms came alive, as young expanding minds saw for the first time how things happened. Complex became simple and simple fascinating. The program assists teachers in schools to meet daily challenges and enhance students’ academic performance and teachers’ productivity with simple, practical & meaningful use of technology” (www.eletsonline.com).
Objective:

“The Vision: To apply innovative solutions to solve critical problems relating to ‘Quality of Education’ and ‘Access to Education’ for all. Smartclass is a digital initiative of Educomp, which is rapidly transforming the way teachers teach and students learn in schools with innovative and meaningful use of technology. Powered by the world’s largest repository of digital content mapped to Indian School Curriculum, smartclass brings in technology right next to the blackboard for teachers in the classrooms. Students learn difficult and abstract curriculum concepts watching highly engaging visuals and animations. This makes learning an enjoyable experience for students while improving their overall academic performance in school. Smartclass also enables teachers to instantly assess and evaluate the learning achieved by their students in class with an innovative assessment technology- smart assessment system – designed by Educomp” (www.eletsonline.com).

Target Group:

“Smartclass benefits all key stakeholders in the education domain be it schools, teachers, students or parents. Over half a million teachers and 8 million students across the country benefit from smartclass in terms of better understanding and appreciation of the concepts taught and learnt. We feel proud to be contributors to a generation of smart students who would have studied through this revolutionary method” (www.eletsonline.com).

Geographical Reach within India: “The current market size is 75,000 public schools across India and this number is growing at about 5000 every year. So far Educomp has penetrated about over 10000 schools across 600 districts. Our curriculum is mapped to all major central and state education boards across the country As the model catches on and becomes more main stream eventually about 900,000 government schools are likely to adopt this solution” (www.eletsonline.com).

Geographical Reach outside India: “Educomp’s subsidiary in Singapore, WizLearn is a world-class education technology services provider commanding a leading
share of the Singapore schools market for web based Learning Management Systems (Asknlearn) and multimedia content (Educomp’s SmartClass). As a Pan-Asian provider of Education solutions and services, Wizlearn also caters to students in Malaysia, Philippines, Indonesia, Brunei, Vietnam, Kuwait, Japan and China. Educomp smartclass program is running in Schools in Bangladesh and Saudi Arabia. It is also being installed in Schools in Nigeria” (www.eletsonline.com).

**Growth of Educomp**

“Educomp Solutions is the largest education technology company in India. The company reaches out to over 25000 schools and 14 million learners and educators globally. Educomp Group has 27 offices worldwide including an office each in Canada and Sri Lanka, two in Singapore, and three in the United States and 20 in India. Educomp addresses the key markets of private schools, government schools, educational content, teacher training, supplemental education services, pre-schools, professional and higher education as well as online learning. Educomp is a publically traded company on the Bombay Stock Exchange and National Stock Exchange (www.eletsonline.com)”.

“Educomp is a leader in several of the market segments it operates in. It has created and owns the largest content library for K-12. It is the largest Professional Development Company, a leading ICT Solutions Company, and the pioneer in education process outsourcing in India. Educomp, the only Education Ecosystem Company in India, has a portfolio of fast growing brands (www.eletsonline.com)”.

“Our flagship businesses of School Learning Solutions: Smartclass and Edureach lead the growth of our business in India. They are the market leaders in their segments of private and government schools respectively. The Smartclass is a teacher-led educational content solution that dramatically improves learning outcomes in private schools. Edureach providing turnkey solutions for computer aided learning in government schools, is the only company in India to have content in 11 regional languages across 14 states in India. Educomp 03, the one on one learning system, is designed with the power of highly evolved classroom strategies using cutting edge technology (www.eletsonline.com)”.

“Educomp is further expanding its reach through programmes such as distance education, higher education, professional training, and special education. For higher education learning programs, Educomp has entered into joint ventures with Raffles and Pearson.
With Raffles Education Corp., Asia Pacific's largest private education group, Educomp has launched its India brand 'Raffles Educomp International'. The premium design institutes, Raffles Millennium International launched in Delhi and Bangalore, are committed to providing quality education through a network of institutions in the Asia Pacific region to develop industry-relevant skilled professionals. With Pearson, the International Education and Information Company, our JV India can seeks to address a growing chasm between education and employability in India, offering skills training for sectors such as financial services and retail (www.eletsonline.com”).

“The higher education learning programs include Fashion Design, Hospitality, Management, Vocational training programs in English language training, as well as a wide range of vocations. Educomp Tele Education Network (ETEN) was set up to address employability training needs in accounting, soft skills, English language and CA coaching through VSAT enabled learning centers across India. Educomp also works with various state governments on the running and management of various Industrial Training Institutes (ITIs) across the country. The Company works in the area of improving the employability of college graduates through its subsidiary A-Plus Education under the brand Purple Leap (www.eletsonline.com)”.

“Educomp is making strides into building brick and mortar schools in the K-12 and higher education segments. 35 High Schools are operational in the 2009-10 session. Educomp's portfolio of schools spreads across 3 brands; Millennium Schools are targeted towards Tier I and Tier II cities, Takshila Schools target Tier II and Tier III cities, and Vidya Prabhat Schools target Tier IV and semi urban towns. There are also 643 preschools operational with Eurokids and Roots to Wings; Educomp's own pre-school brand for the 2009-10 session. Central to Educomp business strategy are state-of-art online, web-based education solutions like Learning Hour, Mathguru and WiZiQ that are widening access to quality education, Learning Hours offers premium tutoring centers. Mathguru is India's first and largest online math tutor and content portal, a web-based platform for students and teachers to discover transact and deliver educational services and connect in real time with audio-video and whiteboard capabilities offers online solutions connecting thousands of teachers and students. It also provides Internet Learning Platform to Learn hub, a Social Learning Network for community building,
online tutoring, web based learning, and digital content. Author Stream is an online power point sharing engine (www.eletsonline.com)

“Educomp has entered US and Singapore markets through acquisitions to avail cross-border opportunities and technology exchange in the same education space. Ask-N-Learn a fully owned Educomp subsidiary is Singapore's largest K-12 Company. Educomp acquired majority stake in Learning.com, the leading web based K-12 Company in US providing curriculum and assessment to thousands of schools and millions of students across the US, Edumatics Corporation is Educomp's fully owned subsidiary in the US based in Ventura, California (www.eletsonline.com)

“Educomp has presence across the Educational Life Cycle spanning an age group starting from age two and moving on to address students over 25 years of age. The backbone of expansion across this value chain is a strong R&D dedicated to creating quality Content and IP to serve the entire ecosystem (www.eletsonline.com)

“The making of Educomp is a story of building equity across the value chain; of being the change that is needed in the world of education, to ignite the fire of learning and the desire to teach, impacting entire communities, and changing lives of millions of students and teachers and showing …What Learning Can Be (www.eletsonline.com)

1.7.1 RESEARCH AND DEVELOPMENT

The Research & Development wing, since its beginning, has devised study material for the entire K-12 range for different kinds/genres of schools, spanning a wide spectrum from premium target groups with higher incomes to the lower middle class segment. These efforts have resulted in creating different pedagogically-designed products. R & D also ensures smooth implementation of curriculum developed and designed by its team. Continuous training sessions for master trainers, teachers and the marketing executives are organised to imbibe the philosophy and methodology of each project and product (www.eletsonline.com).

The Research & Development wing at Educomp has more than 100 professionals and specialists related to the field of education. Each member of the team has a unique identity and specialisation that adds to the diversity, sensitivity and development of the
department. There is a robust blend of optimism, vision, questioning, far-sightedness, hard work and quality consciousness amongst the members of the team. This provides a healthy platform for interaction, innovation, growth and change. Each team member is futuristic in approach and attitude and ever ready to take up new challenges so as to learn, create, grow and evolve. Thus, at R & D, the team of special educators, researchers, engineers, analysts, designers, illustrators and technicians join hands with the motto to strive harder and soar higher to create a better tomorrow (www.eletsonline.com).

Educomp’s R & D has pioneered a vast range of products to meet the needs of learners from all segments of society. Changing trends have always enthused R & D to experiment and innovate to redefine the old and to create new learning systems in the fields of curriculum, assessment and language. The learning systems created at R & D offer a multitude of curricula to match the requirements of the target groups which range from young preschoolers to mature learners. Our pioneering Pre school curriculum, Little Millennium, aims at developing language, cognitive, gross motor, fine motor, socio emotional skills, personal awareness and nurturing individual talent in the long run. The Seven petals and Eclectic approach in Little Millennium is an outcome of 15 yrs of intense research in areas of pedagogy and instructional design, so tailored as to develop intended skill in focused theme and age group (www.eletsonline.com).

1.7.2 Class Rooms as Centers of Learning

A classroom is responsible for maximum learning in the life of a learner. The smartclass is an innovative technology integration solution that aims to revolutionize the way teachers teach and students learn right inside the classroom. In the class, the students benefit from topics in their curriculum converted into animations that they can relate to and visuals that help them remember and retain. Smart class equips teachers with teaching aids mapped to the topics that they need to cover on a day-to-day basis. The programme helps the teachers to meet their challenges in class with practical and friendly use of technology. The focus is also to assist teachers in enhancing the academic performance of their students.
1.7.3 Smartclass Programme

An existing space inside the school campus is converted into smartclass Knowledge Center with a dedicated server connected to the existing classrooms through a campus-wide Ethernet network. Inside the Knowledge center, the extensive content repository resides in a user friendly application engine. The system enables teachers to have individual logins where in topics are presented as per their teaching schedule. Smart class is powered by a vast repository of digital instruction materials exactly mapped to meet with the specific objectives laid out by different state learning standards. This repository is aggregated and continuously populated through ongoing development at Educomp's Digital Products and Solutions (DIPS) group, located in a state of the art 30,000 sq feet facility in Noida Special Economic Zone near New Delhi, India. The curriculum reach unfolds from Kindergarten to Grade twelve covering subjects from Mathematics, Science, English, Social Studies, Physics, Chemistry, Biology, History, Civics, Geography and Commerce.

1.7.4 No More Checking Homework Assignments

Assessment is the key to discovering the achievement of learning outcomes. The Smart Assessment System helps teachers with instant assessments. A set of questions are displayed on the screen. Each student is equipped with a wireless smart assessment device to click the correct answer. At the end of each test, responses are instantly registered by smartclass engine giving a detailed feedback on every student and the class as a whole. This helps the teacher to both assess the students’ and provide remedial teaching.

1.7.5 Guiding Principles of Smart Class

The smartclass helps the teacher to teach abstract curriculum concepts that are difficult for students to visualize or relate to. The teacher thus maintains the student's interest and engagement in learning inside the classroom. The fact that the teachers guide the pace of learning and explain the topic in their own words with the help of digital content to the students, helps them to be cognizant of the wide diversity of learning styles
in the classroom. The solution thus permits the teacher to center all teaching around students' response. Smart Class creates a system that allows learning to be instantly and continuously assessed and interpreted to ensure that all learning gaps are remediated.

1.7.6 Solutions Provided by Edureach to Bridge the Digital Gap

Multimedia Curriculum Content in Regional Languages

Educomp is one of the pioneers who have been engaged in creation of Multimedia Contents in 11 Regional languages in the country including tribal language Bodo. The content created is a combination of computer literacy and curriculum based content. The topics selected for the content creation are such that the concepts and ideas are best explained using multimedia and audio so that the content can be taught in an interesting and interactive manner to ensure that the child learns to use the computer as a tool to enhance his existing knowledge base.

Computer Aided Learning (CAL)

Using Computer Aided learning (CAL) methods, students can easily understand some of the most difficult topics of the subjects in joyful and interesting manner through audio visual aids. These audio visual aids/images display the data and the mathematical relation of the topics for interpretation, especially of multi-dimensional cases. The teacher's are also benefited in a way that they can improve their teaching and learning skills by delivering our module contents and supporting our course using Computers and Information Technology.

Computer Education Programme (CEP)

Educomp has been executing Computer Education Programme for more than a decade with various state Governments across country. The contract is usually in the nature of a Build–Own-Operate- Transfer (BOOT) arrangement, wherein all assets are transferred to the school nominated by State Government at a nominal residual value at the end of the contract period. Educomp does the upfront Hardware and Software investment and pays for expenses such as teacher salaries and consumables during the duration of the contract.
Teacher Training

Teachers are key forces in tapping ICT-facilitated learning opportunities and bridging the digital divide in education between and within the countries. Now Edureach has had a profound impact on the roles of teachers in an information-intensive society.

MAGIKEYS™

MagiKeys™ revolutionary software provides Chat, Email and Online Word Processing, with amazing virtual keyboards in English, Hindi, Bengali, Telugu, Marathi, Tamil, Gujarati, Kannada, Malayalam, Urdu, Konkani & Punjabi. MagiKeys further transforms any website, email, and chats to be in 12 Indian languages.

Mathemagic Kit

A 'Mathemagic Kit' provides wide variety of materials to play with and learn the concepts. Math's teaching and learning can be done with activities using manipulative and experiments by students. Mathemagic Kit also encourages group learning and cooperative learning among children.

Edumate™

Educomp has developed Edumate™, an easy-to-use, portable compact unit that combines a high-end multimedia computer, a projector with facilities like TV tuner card, PCI modem for Internet connectivity, fax. Developed by Educomp, the Edumate's matchless features make it a high-powered tool for Education and Communication. Edumate combines the computer system with high resolution projection system. Edumate can be loaded with teaching aids like multimedia content which enhance the student understanding by explaining the difficult concepts using multimedia.

Edusat contents

EDUSAT launched on September 20, 2004 is the first exclusive satellite for serving the educational sector. It is specially configured for audio-visual medium, employing digital interactive classroom and multimedia multicentric system. The satellite will have multiple regional beams covering different parts of India. Educomp is working
with Government of Punjab to deliver lesson through EDUSAT in the Government schools of Punjab.

**Innovations of Educomp programme/project/initiative:**

1. Using 2D & 3D graphic audio-visuals and digital interaction with the content the learners acquire the knowledge of concepts and theories live.
2. Teachers use formative assessment to know the understanding level of the learners and can accordingly adjust their teaching learning.
3. The complex sketches and diagrams are drawn step by step using Diagram Maker.
4. For graphic presentation of chapters covering important aspects Mind Maps are organized.
5. “Virtual Laboratories” are offered to students by the Smartclass. Teachers are enabled to construct and simulate concepts on computers by virtual experiments.
6. Smartclass provides access to ready made presentations, real life applications and worksheets containing various types of questions for the teachers.
7. Smartclass provides teaching ideas on how teachers could transact some part of the lessons.
8. Teachers summarise the chapters using Topic Synopsis (a short summary of chapters).
9. Instruction materials can be operated and manipulated by the teachers with handy remote control when away from board.
10. It works in all kind of environments such as high ambient temperature and dusty conditions because of its special design.

**Achievements of the programme/project/initiative:**

1. Smartclass is enriched by a large number of stored digital instruction materials, with a variety of highly animated, lesson specific, 3D and 2D multimedia
modules. Difficult and abstract curriculum concepts are learned and enjoyed by the learners which results in improvement of overall academic performance.

2. Students learning is instantly assessed and evaluated by the teacher with the help of innovative technology enabled smart assessment system.

3. All socio-economic backgrounds can afford Educomp smartclass. More than 20,000 schools have adopted it. Till date 90% schools that have installed technology in classrooms have gone for smartclass.

4. ‘Dun and Bradstreet’ an independent research agency has authenticated the effect and efficiency of learning through Educomp smartclass.

1.8 Mathematics in Society

S. Chapin in his book named ‘The Partners in Change Handbook Mathematical Knowledge, its Relevance and Importance’ says, “It is the reasoning that lies at the heart of mathematics. Without reasoning we cannot do mathematics. Teachers need to provide their students with many opportunities to reason through their solutions, conjectures, and thinking processes. Opportunities in which very young students . . . make distinctions between irrelevant and relevant information and attributes, and justify relationships between sets can contribute to their ability to reason logically.”

Howson and Kehane (1990); Black and Atkin (1996) further support Chapin by saying, “In today’s modern and technological society with complicated social needs and structures mathematics plays a very important role in communication and development. To become true members of society everybody need to be fluent in mathematics to some extent, and all should have the opportunity to see the power and beauty of mathematics in contributing to richness and fulfillment in their lives.”

Pimm (1987) also has the similar view, “We concentrate mainly on mathematics teaching and learning and their development for the broader enhancement of mathematical understanding and its application. We observe mathematics to be richly related to language as an instrument for communication, and also as a language in its own right.”

To use the maximum power of mathematics in their lives learners need a rational or principled interpretation of mathematical concepts (Skemp, 1976; Edwards and
Mercer, 1987). It signifies that they must develop mathematical skills, know number facts, apply arithmetical procedures correctly, recognize and relate shapes and use statistical formulae, they must also perceive the meaning and related of concepts and develop dual understandings that they must apply to problems in their day today world (Askew et al. 2000). They should be able to draw on mathematics knowledgeably in making informed decisions in life and work. Such principled knowledge ability requires understanding of the nature of mathematics itself in generalization and abstraction (Nardi, 1996).

Importance of Mathematics

- CD players and computers function on the applications of error correcting codes of mathematics.

- It is the mathematics that is responsible for the crispness and quality of the stunning pictures of far away planets sent by Voyager II.

- Differential equations of mathematics have made the Voyagers’ journey possible to the planets by making calculations.

- The theories of mathematics are responsible for the speed and accuracy of supercomputers which instructs the computer what is to be done.

- The theories of physical sciences (Chemistry, Physics, Oceanography, and Astronomy) require mathematics for their development.

- Laws of population changes of ecology are studied using mathematics.

- For the analysis of different kinds of data theories and methodology of Statistics are required.

- In the field of medicine also, statistics plays very important role for analyzing data on the causes of illness and on the utility of new drugs.

- The mathematics of airflow and of control systems has made travel by aeroplane possible.

- Body scanners, discovered in the 19th century, are the expression of subtle mathematics and has made possible to construct an image of the inside of an object from information on a number of single X-ray views of it.

Thus, we can conclude that mathematics is involved in matters of life and death.
### 1.9 Role of Smart Technologies in Mathematics Learning

Jean Piaget’s (1973) revolutionized the world by saying, “*Every normal child is capable of learning mathematics*” and as a result have put greater pressure on dispensers of mathematical knowledge and producers of knowledge of mathematics education; they cannot escape by transferring the buck of the poor mathematical ability of the learners.

New millennium is the age of science and technology, since the traditional teaching techniques are not sufficient to arouse interest among the learners and do not satisfy the intellectual, psychological and emotional needs of the students, the techniques of teaching mathematics need to be revised. The use of smart technology into teaching and learning of mathematics has also not escaped the attention of educators. As a discipline, mathematics too is very much influenced by the speedy development of Information and Communication Technology (ICT) and mathematics educators have been looking at ways to integrate smart technology into the curriculum over the last decade (BECTA, 2003). The key benefits are ICT promotes greater collaboration among students and encourages communication and sharing of knowledge. ICT gives rapid and accurate feedback to students and this contributes towards positive motivation. It also allows them to focus on strategies and interpretations, answers rather than spend time on tedious computational calculations.

Traditionally, mathematics teachers’ lecture and their learners learn just by listening. Learners develop a narrow set of skills which quickly fade. Research in mathematics education suggests that more than knowledge of content is required to be successful in mathematics. McLeod (1988) suggested that a learner’s ability to master mathematical contents is shaped by the learner’s attitude towards the content. More active approaches to ICT learning show that students can indeed develop deep understanding that does not fade over time. Researchers claim that in comparison to conventional methods of teaching, computer-mediated instruction can enhance a student’s conceptual change in understanding scientific conceptions (Reid et al., 2003; Ronen and Eliahu, 2000). The new technological tools such as computers and computer software have provided educators and students with more opportunities to teach and to learn mathematics in new ways. Yu (1998) used a computer-assisted instruction and found that it increased students’ performance and attitude towards science Computer
animations actively engage students in the learning process. If a picture is worth a thousand words, then pictures that move must be worth a fortune. Most computer animations currently used for mathematics instructions are written in language such as Java, Maple or Mathematic. Cox et al. (2003) also found that animations and simulations enhanced understanding in mathematics and science and that ICT could create a range of diagrams and other graphical representations of concepts and processes not possible with traditional forms of resources.

Computer tools can help students and teachers manipulate complex datasets. This then provides a context for effective discussion which in turn can help develop mathematical understanding (McClain and Cobb, 2002). ‘Visualisation tools’ can help learners to picture scientific ideas (Jonassen, 2000) or to develop conceptual understanding.

Technology facilitates the students to do numerous computations quickly using calculators. Students are thus enabled to check computations quickly and accurately, thus allowing them to check and explore the validity of their conjectures (Hennessy, Fung and Scalon, 2001).

Over the last few decades, new technology has become a very important factor in everyday life. Nowadays, computers are vital for business and economy and ‘Computer Literacy’ is considered a very important skill in our society. Knowing about the increasing importance of new technologies for everyday life, several educational organizations started to develop technology-related standards (Lawless and Pellegrino, 2007), trying to foster the integration of new technology into teaching and learning.

During the last 25 years, computer technology for mathematics classrooms experienced an explosive growth in terms of development as well as availability. This was accompanied by an enormous enthusiasm concerning the potential of new technology for teaching and learning mathematics (Fey et al., 1984). Consequently, substantial money was invested into equipping schools with hardware, software and internet access in order to create an environment that allows technology integration into classrooms (Lawless and Pellegrino, 2007; Cuban et al., 2001).

In mathematics, the key benefits identified from research into ICT use have increased pupil motivation, a more concentrated focus on strategies and interpretation,
faster and more accurate feedback to pupils and greater pupil collaboration and cooperation (Becta, 2003d).

ICT use made a major contribution to developing problem solving skills, practicing number skills and exploring patterns and relationships. Cox et al. (2003a) also found that animations and simulations enhanced understanding in mathematics and science and that ICT could create a range of diagrams and other graphical representations of concepts and processes not possible with traditional forms of resources. They noted that many benefits had been identified regarding the use of LOGO in the late 1990s. These included the development of problem solving skills, transferable skills, higher-order levels of mathematical thinking and the learning of geometric concepts as well as enhanced social interaction through group tasks. Unfortunately, the use of LOGO appears to have diminished as other forms of ICT have been adopted. Concern was also expressed that ICT was used less in mathematics than in many subject areas. This was also noted in ImpaCT2 (Harrison et al., 2002), where 67 per cent of pupils at KS3 never or hardly ever used ICT in mathematics, although at KS4 the figure was over 80 per cent. The use of software that enabled pupils to view their designs in 3D was found to enhance the quality of pupils’ work (Ofsted, 2005). Different kinds of technologies and tools have been used for centuries in mathematics, e.g., tools for measurement, calculations and mathematical notion and symbol system. There are cognitive technologies that help the students transcend the limitations of the mind (Pea et al. 1981).

Computer software is a special powerful cognitive technology for learning mathematics. This can take the form of an amplifier. “Use of tools results in significantly higher achievement in conceptual areas and their computation and manipulation skills”. (McCoy, 1996)

Computer algebra systems, dynamic geometry software and the spreadsheets are the main types of educational software currently used for mathematics teaching and learning. Information can be manipulated easily on a computer so that pupil can make changes and evaluate the effect of those changes. This can be where the information is of the same type such as text in word-processing or numbers in spreadsheets or where it is in different forms such as between tables and text.
A graph plotter is characterised as “generic organiser”. By utilizing the zoom tool in the software specific features of function, graphs might be highlighted. A combination of tools may give the best support for learning, since the different tools can support different phases in the student’s conceptual development. Nakhleh and Krajcik, 1993 suggest gains in students’ abilities to interpret graphs.

ICT is used to promote discussion in small groups and in whole class settings that can help to develop pupils’ thinking and understanding across the curriculum in a variety of subjects and with a range of outcomes. Evidence for this comes from a number of studies involving different curriculum subjects, learners’ mathematical thinking, their individual reasoning, their higher-order thinking through ICT as a subject, conceptual change in science, creativity through Logo programming etc.

Numerous studies document student understanding of mathematics concepts from using computer-based and computer -assisted software. Logo programming, computer assisted instruction (CAI) micro-worlds and algebra and geometry software are among those effective in facilitating mathematics achievement for elementary, middle and high school students when teachers are skilled in guiding student activities.

Students can use simple modeling packages, to gain insight into mathematical functions. Graphic calculators can also be used for this purpose. Modeling and simulation too can be used with special software for geometry and stereometry to give students a greater understanding of figures in two and three dimensional space. Wenglinsky (1998) founds that teaching higher level mathemetic concepts to eighth graders (e.g., applications and simulations) has a positive effect on academic achievement. There is evidence of the impact of ICT on practicing skills from a wide range of studies including simple programs with a particular focus such as learning about negative numbers in mathematics (Hativa and Cohen, 1995) or early reading (Mioduser, Tur- Kaspa, and Leitner, 2000) as well as more complex Integrated Learning Systems (ILS) which have all improved pupil attainment. Some researchers have suggested that pupil practice is a crucial factor in any improvement in pupil’s attainment (Van Dusen and Worthen, 1995; Underwood and Brown, 1997). Software can ensure that learners are given tasks at an appropriate level that can be matched at their prior attainment or their individual needs (Lynch, Fawcett and Nicolson, 2000). The National Council of Teachers of Mathematics
(NCTM), which is the world’s largest association of mathematics teachers declared technology as one of their six principles for school mathematics. Technology is essential in teaching and learning mathematics; it influences the mathematics that is taught and enhances students’ learning (NCTM, 2000, p.11).

1.10 Need of the Study

“Smart Technology offers many benefits to enhance education. Most importantly, technology integration has the potential to increase student motivation (Anderson, 2000).”

The research studies of Brophy (1983); Meece (1991); Miller & Meece (1999) indicate, “Smart Technologies empower learners by engaging them in the learning process. The nature of the task shifts from teacher centered to student-centered. Research indicates that challenging and engaging academic tasks that build upon students’ prior knowledge and enable students to construct their own understanding of the content are more apt to enhance student motivation and increase student self-confidence in the cognitive abilities.”

Research also identifies the benefits of smart technology integration as the technical aspects to improve the quality of work, encourage resources within reach, positively impact student learning, and improve student meta-cognitive skills (Heafner & McCoy, 2001; Scheidet, 2003).

Levin (2005) acknowledged, “the ways people live, work and communicate are already being changed through ICT. First, the way people live and work is changing.”

For modern learners, there is a much greater need for understanding of modern world and its diverse cultural awareness. So, today’s learners no longer want to be passive recipients in the information transfer model of learning. Rather they want to be active participants in the learning process. As noted by Driscoll (1994), “we no longer can view learners as empty vessels waiting to be filled, but rather as active organisms seeking meaning.”

There is an increasing trend that modern world requires that learners be able to work collectively and cooperatively with others, think critically and creatively and reflect on their own learning process. ICTs provide powerful tools to support the shift to student-centered learning and new roles of teacher and student. Ittigson and Zewe (2003) cited,
“technology is essential in teaching and learning mathematics. ICT improves the way mathematics should be taught and enhances student understanding of basic concepts.”

Many researches have been carried out to evaluate the benefits of using smart technologies in mathematics. Becta (2003) summarized the key benefits – “ICT promotes greater collaboration among students and encourages communication and sharing of knowledge. ICT gives rapid and accurate feedback to students and this contributes towards positive motivation. It also allows them to focus on strategies and interpretations of answers rather than spend time on tedious computational calculations. ICT also supports constructivist pedagogy, wherein students use technology to explore and reach an understanding of mathematical concepts.”

Mathematics is still not an easy and inaccessible subject to most learners. The fact is not only accepted globally, but it is, consciously or unconsciously, being transferred from one generation to another. Despite this difficulty, mathematics remains a fundamental requirement for all science and technology courses. According to Papert (1980) “failure of so many students to learn mathematics is largely due to a lack of mathematics culture in adults and the scarcity of adults within mathematics who know how to ‘speak mathematics’”.

Because of concerns about low levels of mathematical attainment, new recommendations for classroom practices have emerged over the last decade that aimed at allowing students to understand mathematics concepts, rather than memories facts. This focus on the Learner’s role in mathematics understanding began the development of reforms in mathematics instruction programs that attempted to incorporate new skills of thinking and working in mathematics. Both curriculum and methodology in mathematics classrooms moved from a behaviourist approach using role learning and practices examples towards an interactive problem-solving approach in specific contexts.

In the modern world, pedagogues need to be kitted out not only with subject expertise and effective teaching techniques but with the capacity to support learners to meet demand of the emerging knowledge based society with new forms of smart technology and need to have the skill to use that smart technology to improve the quality of learning. The search for methods to integrate smart technology into mathematics education is influenced by two main factors. First is the explosion of smart technologies
that is influencing all spheres of human life and the development of human resource. Knowledge-based workers need to be smart technology savvy as well as having critical and creative thinking skills. Second is the mathematics education reform that is now emphasizing the development of mathematical processes. With the emphasis on mathematical process, the scope of the use of smart technology in the mathematics classroom has, in fact, increased. With smart technology, boring calculations are easily solved, multiple examples of geometric figures effortlessly produced. Combined with variety of visuals, smart technology as a result provides an approach of realizing classroom lessons that encourage mathematics thinking.

The use of smart technology can, in fact, make easier the latest reform of mathematics, teaching designs that focus on mathematical processes as it offers quick and accurate calculations as well as moving visuals as those found in geometry and graphs. This then provides learners and teachers more time to emphasise on the mathematical processes in the classroom. Learners can develop and demonstrate more understanding of mathematical concepts and are able to deal with more advanced mathematical contents than in ‘traditional’ teaching environments.

During the last twenty years, investigators have become more concerned about the important role teachers play for learner’s achievement, with the implicit supposition that better teacher performance in terms of mathematical subject knowledge, teaching methodology and technology integration in addition to the knowledge about research outcomes would sufficiently prepare teachers for an easy and effective integration of smart technology into their classrooms. Hence, the need for the study effect of Educomp Smartclassroom on the achievement & retention in Mathematics at Elementary level.

1.11 Statement of the Problem

“Effectiveness of Educomp Smartclassroom on the Achievement and Retention in Mathematics at Elementary Level”
1.12 Operational Definitions of the Key Terms

A few terms have been frequently used that have got specific meaning for the present investigation. Given below are the operational definitions some of such key terms.

**Educomp Smartclass**: Educomp Smartclass is a new technology based digital trailblazer plan invented by Educomp that makes available a large store house of 3D animated modules and videos mapped to school curriculum with the help of its exclusive collaboration with Eureka, Designate and Discovery.

**Achievement**: Achievement of the students in Mathematics after administering the Mathematics Achievement Test.

**Retention**: The ability to retain facts and figures in memory.

1.13 Objectives of the Study

1. To develop an Achievement test in Mathematics for VIII Graders.

   (A) **Objectives Related to Achievement In Mathematics**

2. To compare the effect of Educomp smart classroom and conventional classroom teaching on achievement in mathematics among VIII graders.

3. To compare the effect of Educomp smart classroom and conventional classroom teaching on the achievement in mathematics among male VIII graders.

4. To compare the effect of Educomp smart classroom and conventional classroom teaching on the achievement in mathematics among female VIII graders.

5. To compare the mean Achievement scores of male and female VIII graders in mathematics to be taught through Educomp Smart Classroom teaching.

6. To compare the mean Achievement scores of male and female VIII graders in mathematics to be taught through Conventional Classroom teaching.

7. To compare the effect of Educomp smart classroom and conventional classroom teaching on the academic achievement in mathematics among urban VIII graders.
8. To compare the effect of Educomp smart classroom and conventional classroom teaching on the academic achievement in mathematics among rural VIII graders.

9. To compare the mean Achievement scores of urban and rural VIII graders in mathematics to be taught through Educomp Smart Classroom teaching.

10. To compare the mean Achievement scores of urban and rural VIII graders in mathematics to be taught through Conventional Classroom teaching.

(B) Objectives Related to Retention In Mathematics

11. To compare the effect of Educomp smart classroom and conventional classroom teaching on the retention in mathematics among VIII graders.

12. To compare the effect of Educomp smart classroom and conventional classroom teaching on the retention in mathematics among male VIII graders.

13. To compare the effect of Educomp smart classroom and conventional classroom teaching on the retention in mathematics among female VIII graders.

14. To compare the mean Retention scores of male and female VIII graders in mathematics to be taught through Educomp Smart Classroom teaching.

15. To compare the mean Retention scores of male and female VIII graders in mathematics to be taught through Conventional Classroom teaching.

16. To compare the effect of Educomp smart classroom and conventional classroom teaching on the retention in mathematics among urban VIII graders.

17. To compare the effect of Educomp smart classroom and conventional classroom teaching on the retention in mathematics among rural VIII graders.

18. To compare the mean Retention scores of urban and rural VIII graders in mathematics to be taught through Educomp Smart Classroom teaching.

19. To compare the mean Retention scores of urban and rural VIII graders in mathematics to be taught through Conventional Classroom teaching.
1.14 Hypotheses

(B) Hypotheses Related to Achievement In Mathematics

1. There will be no significant difference in the effects of Educomp smart classroom and conventional classroom teaching on the achievement in mathematics among VIII graders.

2. There will be no significant difference in the effects of Educomp smart classroom and conventional classroom teaching on the achievement in mathematics among male VIII graders.

3. There will be no significant difference in the effect of Educomp smart classroom and conventional classroom teaching on the achievement in mathematics among female VIII graders.

4. There will be no significant difference in the mean achievement scores of male and female students in Mathematics to be taught through Educomp Smart Classroom teaching.

5. There will be no significant difference in the mean achievement scores of male and female students in Mathematics to be taught through conventional classroom teaching.

6. There will be no significant difference in the effects of Educomp smart classroom and conventional classroom teaching on the academic achievement in mathematics among urban VIII graders.

7. There will be no significant difference in the effect of Educomp smart classroom and conventional classroom teaching on the academic achievement in mathematics among rural VIII graders.

8. There will be no significant difference in the mean achievement scores of urban and rural VIII graders in Mathematics to be taught through Educomp Smart Classroom teaching.

9. There will be no significant difference in the mean achievement scores of urban and rural VIII graders in Mathematics to be taught through conventional classroom teaching.
(B) Hypotheses Related to Retention In Mathematics

10. There will be no significant difference in the effects of Educomp smart classroom and conventional classroom teaching on the retention in mathematics among VIII graders.

11. There will be no significant difference in the effects of Educomp smart classroom and conventional classroom teaching on the retention in mathematics among male VIII graders.

12. There will be no significant difference in the effect of Educomp smart classroom and conventional classroom teaching on the retention in mathematics among female VIII graders.

13. There will be no significant difference in the mean retention scores of male and female students in Mathematics to be taught through Educomp Smart Classroom teaching.

14. There will be no significant difference in the mean retention scores of male and female students in Mathematics to be taught through conventional classroom teaching.

15. There will be no significant difference in the effects of Educomp smart classroom and conventional classroom teaching on the retention in mathematics among urban VIII graders.

16. There will be no significant difference in the effect of Educomp smart classroom and conventional classroom teaching on the retention in mathematics among rural VIII graders.

17. There will be no significant difference in the mean retention scores of urban and rural VIII graders in Mathematics to be taught through Educomp Smart Classroom teaching.

18. There will be no significant difference in the mean retention scores of urban and rural VIII graders in Mathematics to be taught through conventional classroom teaching.
1.15 Delimitations of the Study

Keeping in view the time available and limited resources, the study will be delimited to:

1. The 8th graders, studying in the schools situated in urban areas of Sonipat District of Haryana.
2. Two units of Mathematics from class VIII syllabus as prescribed by CBSE.