Abstract:
This paper in its endeavour documents and examines the role of communication technology in improving the process of teaching and learning in schools and colleges in India. India’s first educational satellite EDUSAT was launched to achieve the goal of universalization of education. There is a paradigm shift from human resource development to human development being the purpose of education. The study examines how the sky teacher proposes to bring in changes in village schools located in remote pockets of India that are deprived of basic infrastructural facilities, by providing better connectivity. Sky tutor is slated to empower the poor and illiterate through education. It is in this perspective that EDUSAT assumes significance. Never in the history of humanity, have the floodgates of technology been brought within the reach of the poor and impoverished. EDUSAT is slated to provide mind boggling services like Radio broadcast, TV broadcast, on-line education through Internet, computer connectivity & data broadcasting, talk back channel, audio-video interaction, voice chat on Internet, asymmetric Internet through TVRO and video conferencing. The digital divide has alienated the poor and impoverished people from reaping benefits of technology and its application. One can hope that based on the research experience of EDUSAT, the current programmes and plans should be suitably modified and updated to reflect the hopes and aspirations of the new generation.

Introduction:
Application of space technology to deal with the problems of education is not new to India. As early as 1960s Dr.Vikram Sarabhai, an eminent space scientist and a visionary took initiative to establish National Satellite
Communication (NASCOM), which prepared the blueprint for INSAT- the Indian National Satellite. The outcome of these developments was the birth of India’s giant television experiment, the SITE- the Satellite Instructional Television Experiment. SITE, a year long experiment became operational in 1975-76 and was undertaken to experiment with satellite linked television broadcasting in support of education and development. One of its major objectives was to improve the primary school education in rural areas and to provide teacher training to strengthen school education. India with its mastery over space technology is again poised to explore EDUSAT for universalisation of education. The ambitious satellite dedicated to education, the EDUSAT was launched for spreading the footprints of education across the Indian subcontinent on September 20, 2004.

**Need for EDUSAT; A Satellite Dedicated to Education:**

In the age of globalization and information, education is a major indicator of human development. Unfortunately India, a nation of one billion has the dubious distinction of having the largest single illiterate population in the world. In a society as diverse as India with multi-cultural, multi-lingual and multi-religious populations, the challenge in educational sector is multifarious. Making education accessible to a nation of one billion is a stupendous task. According to 2001 census though India has seen increase in the rate of literacy from 19 percent in 1951 to 65.37 percent in 2001, the number of illiterates is 302 million. In the era of women’s empowerment, India still has a very high rate of illiteracy among women, about 45.84 percent. India is said to be a land of villages and agriculture has a large segment of rural illiterate population i.e., 43.3 percent against the urban rate of illiteracy of 19.9 percent. Obviously India’s education agenda cannot afford to ignore the vast illiterate population in rural areas in general and female illiteracy in particular.

India has seen massive expansion in school education under the popular programmes from ‘operation black board’ to ‘Sarva Shiksha Abhiyan (SSA)”. Today there are 6.42 lakh primary schools, 1.98 lakh higher primary schools and 1.20 lakh secondary and senior secondary schools in India. One of the perennial problems of school education in India is the
unusually high dropout rate. According to statistics, a whooping 40.25 percent and 54.53 percent of children dropped out from the primary and higher primary grades respectively. Interestingly the dropout rate was more among girls. The fact that nearly 30.58 million children in the age group of 6 to 11 years do not go to school is alarming. The government armed with the Universal Secondary Education by 2015 declaration is anticipating a quantum increase in the school enrollment. It is estimated that there will be 6.9 million new students in schools demanding more trained teachers and schools with better infrastructure.

The scenario of higher education is also far from satisfaction. India has over 320 universities and 15,500 colleges. As far as professional education is concerned there are 804 teacher education colleges, 1082 polytechnics, 635 engineering colleges, 686 medical colleges and 635 management institutions. Currently 7.73 million students are enrolled in higher education. Nearly 85 percent of these students are in graduate programmes and a very low percentage is enrolled in post graduate courses and research programmes. Nevertheless the enrollment is expected to grow at about 4.8 percent rate annually. It’s therefore estimated that there will be 10 million students by 2011 in higher education sector.

These optimistic projections demand creation of massive infrastructure in schools and colleges necessitating huge budgetary allocations by both central and state governments. These preparations hold good for curriculum and textbook based learning. The government cannot ignore educating an unorganized population who falls outside four walls of the classroom. As per UNESCO declaration, education is not restricted to curricular learning, as learning is currently perceived as a lifelong process. It is obligatory on the part of every nation to provide lifelong meaningful education to its citizenry irrespective of age and gender. Therefore the concept of education has been reinvented to include education of mind, body and soul. Today education is more comprehensive and is viewed from broader perspectives. There is a paradigm shift from human resource development to human development being the purpose of education. It is in this perspective the launch of EDUSAT assumes importance and relevance.
EDUSAT; The Satellite Designed to Take Sky Teacher to the Village Schools;

EDUSAT is India’s first and exclusive satellite meant for educational purposes that has been conceived and developed by Indian Space Research Organization at a cost of Rs. 30.4 million in the first phase. The already existing GSAT-3 satellite is configured to meet the initial requirements of EDUSAT and the satellite was put into geo-stationary orbit by GSLV-3. In the age of electronic superhighways, EDUSAT, orbiting in space would provide better connectivity to schools starved of basic infrastructure and teachers. GSAT-3 is the first phase of EDUSAT, which will be used to provide satellite-based education across the country, virtually creating modern classrooms in rural areas.

According to the Department of Space, EDUSAT programme has been launched to provide a sustainable distance education service in India using advanced space technology and ground technology of media convergence. This system is primarily meant for school, college and higher education on one hand and to support non-formal education on the other. The EDUSAT utilization has been planned to be implemented in three phases namely Pilot Project Phase, Semi Operational Phase and Operational Phase. Pilot projects have been taken up under EDUSAT programme in Karnataka, Maharashtra and Madhya Pradesh ahead of EDUSAT launch using INSAT-3B. In Karnataka, the Visveswaraya Technological University (VTU) has begun regular classes providing lessons for 100 Engineering Colleges from September 15, 2004. In Maharashtra, Y B Chavan Open University is conducting regular contact classes in 75 locations spread over the State from October 20, 2004. In Madhya Pradesh, Rajiv Gandhi Technical University is conducting trial transmission of classes with 25 nodes. Karnataka Primary Education Pilot Project under ‘Sarva Shiksha Abhiyan’ covering about 885 primary and secondary schools is under implementation.¹

The Characteristic Features of EDUSAT;

EDUSAT project was conceived in 2002 and it took two years to be completed. The credit for indigenously designing and developing the vehicle
GSLV goes to the Vikram Sarabhai Space Centre situated at Thiruvananthapuram in Kerala. The satellite was developed by the indigenous expertise of the Indian Space Research Organization at Bangalore in Karnataka. However it was the Space Applications Centre at Ahmedabad which developed its heaviest ever payloads. EDUSAT, the country’s first thematic satellite, was launched into a Geosynchronous Transfer Orbit (GTO) by 414 tonne and 49-metre tall India’s Geosynchronous Satellite Launch Vehicle, GSLV-F01 from Satish Dhawan Space Centre SHAR (SDSC SHAR) at Sriharikota in Andhra Pradesh on September 20, 2004.

The Master Control Facility (MCF) at Hassan in Karnataka is monitoring the control of EDUSAT for all its post launch operations. Ground stations at Lake Cowichan (Canada), Fucino (Italy) and Beijing (China) are supporting MCF in monitoring the health of the satellite and its orbit raising operations. Weighing 1950 kg, EDUSAT carries five Ku-band transponders providing spot beams, one Ku-band transponder providing a national beam and six External C-band transponders with national coverage beams. It will join the INSAT system that has already got more than 130 transponders in C-band, Extended C-band and Ku-band providing a variety of telecommunication and television broadcasting services. The successful launch of EDUSAT by the first operational flight of GSLV-F01 further demonstrates India’s triumph in space research. Planned to last 8-10 years, EDUSAT will have Ku-band transponder and another five Ku-band transponders will cover India’s mainland and provide spot beams towards northern, northeastern, eastern, southern and western regions across the entire country. The EDUSAT will reach its 36,000 kilometers high geostationary orbit and there it will be co-located with INSAT-3C and KALPANA-1 at 74 degrees east longitude. The technical features of EDUSAT are:

- Ku Band operation
- Small size, low cost ground hardware
- Decentralized Teaching Centre
- Multiple and Simultaneous Networks
- High bandwidth two way interactivity
- 384 KBPS from classroom
- Multi media multi casting
- Constant rate throughput
- Adopting an open standard approach for ease of expansion

**The Technological Potentiality of EDUSAT:**

- TV broadcast
- Radio broadcast
- Video conference
- Voice chat as Internet
- Webcam as return link
- Talkback channel
- Internet
- Telephone
- Online education through Internet

**The General Objectives:**

- To educate the nation
- To provide education on demand
- To make education accessible at home

**The Specific Objectives:**

**Primary and Secondary Education:**

- To increase the rate of school enrollment
- To increase female literacy
- To remove gender disparity
- To arrest the rate of drop out
- To improve the quality of teaching
- To improve the quality of learning
- To empower students
- To empower girl students
- To enhance the level of students' performance
- To bridge the gap between students and teachers
- To make learning participatory
• To increase learning resources
• To create school database
• To reform the evaluation process
• To train teachers in student centric learning
• To bridge the gap between schools and the community
• To facilitate participation of parents

*Distance Education:*
• To provide quality based open distance learning
• To improve the teaching-learning process
• Networking among open universities to exchange content and databases
• Networking among open and regular universities to link campuses and classrooms
• To promote radio counseling
• TV broadcasting
• Radio broadcasting
• Teleconference
• To facilitate open education through ICT networking of students and teachers by creating ICT equipped study centres in rural, backward and remote places
• To establish virtual classrooms for imparting education electronically
• To eradicate adult illiteracy by promoting continuous learning among unenrolled persons viz., farmers, artisans, labourers, housewives and others
• To bridge the digital divide by enhancing access to learning resources
• To increase women's education
• To empower women
• To train teachers of primary and secondary schools

*Professional Education:*
• To achieve quality and excellence in technical education
• Networking of institutions - engineering, medical, management
• Online counselling for students seeking professional education
• Resource sharing among professional colleges through video conferencing, networking of classrooms
To create digital libraries
To facilitate web based learning
To train teachers in technical education
To improve instructional inputs
To improve methods of teaching and learning
To bring about changes in the methods of evaluation
To make professional education accessible to disabled and other weaker sections of the society
To empower women
To impart professional skills to women

According to DECU- the Development and Educational Communication Unit, of ISRO, the EDUSAT generally aims at using **Satellite-based Educational Programme**;

- to provide effective teacher training
- supplementing the curriculum based teaching
- greater community participation and monitoring
- providing access to quality resource persons
- strengthening the distance education
- taking education to all parts of the country
- providing access to new technologies

**Significance of EDUSAT**

EDUSAT was successfully launched into a Geosynchronous Transfer Orbit (GTO) from Satish Dhawan Space Centre SHAR (SDSC SHAR), Sriharikota by indigenously designed and developed India’s Geosynchronous Satellite Launch Vehicle, GSLV on September 20, 2004. Branded as Sky Teacher, India’s first thematic satellite dedicated exclusively for educational services is designed to provide a variety of telecommunication and television broadcasting services.

Research on the various approaches to use of satellite-based education in bettering lives of the underprivileged is hoped to bridge the much talked about digital divide. Most importantly, the new and unique education from the sky will be an eye opener for other developing countries
in Asia as it facilitates sharing of information and knowledge and paves the way for universalisation of education. The sky tutor is slated to empower the poor and illiterate through education. It is in this perspective that EDUSAT assumes significance. Never in the history of humanity, have the floodgates of technology been brought within the reach of the poor and impoverished. EDUSAT is slated to provide mind boggling services like Radio broadcast, TV broadcast, on-line education through Internet, computer connectivity & data broadcasting, talk back channel, audio-video interaction, voice chat on Internet, asymmetric Internet through TVRO and video conferencing. This experience will bring this part of the world on par with developed countries and help countries in Asia to reap benefits of better connectivity. It will also be used for interactive satellite based distance education system in India. EDUSAT, which is armed with ICT capabilities, is configured to provide access to digital interactive classroom and multimedia multicentric system with provision for multiple regional beams reaching the length and breadth of this country.

Satellite a significant tool of educational technology as a tutor will be demonstrated by the launch of EDUSAT. Today there is widespread dissatisfaction with our educational system among educators, parents and policymakers. Efforts to reform and restructure education have met with low success rate as the role of social context of learning has been marginalised. Community's vision of learning needs to be integrated into goals of education. Further the digital divide has alienated the poor and impoverished people from reaping benefits of technology and its application. One can hope that based on the research experience of EDUSAT, the current programmes and plans should be suitably modified and updated to reflect the hopes and aspirations of the new generation. EDUSAT has the capability to provide ICT linked educational to infrastructure to deprived village schools and facilitate the state governments to accomplish the task of education for all. The ICT based education will promote distance education and infuse quality in conventional system of education. The satellite has given impetus for e-learning enabling students to access quality content materials in the multimedia form consisting of graphics, video and well-
designed texts. The State of Karnataka has already shown the way by launching the first ever e-learning site on January 8, 2005 by the Vishweshwaraih Technological University in partnership with ISRO for the benefit of students of engineering colleges.

The President of India, A.P.J. Abdul Kalam, predicts that EDUSAT will be a boon to students as they are destined to receive quality education. The President who is also an eminent scientist states that 'EDUSAT is useful for schools, colleges, higher level of education and non-formal education, EDUSAT, when fully operational will have 30 up links and about 5,000 remote terminals per up link. Expected to provide 150,000 ground terminals at full capacity, EDUSAT is not merely a Receive Only Terminal system; it works on an IP protocol and brings both-way interactivity and collaboration. EDUSAT coupled with broadband through fiber, and Wireless Broadband, will form a heterogeneous network for providing quality education. For example, students at Samastipur in Bihar could receive a mathematics teacher at Bhimavaram in Andhra Pradesh, in real time. Hence good teachers teaching anywhere, in any language can be heard, seen and interacted with through this delivery system.'

EDUSAT in Karnataka State

Karnataka State is not new to Satellite-based Educational Programme. Way back in 1975-76, Karnataka was one of six states selected to experiment with television through satellite communication to broadcast programmes to 2400 villages under SITE- Satellite Instructional Television Experiment. In 2003 ISRO selected Karnataka besides Maharashtra and Madhya Pradesh, for conducting EDUSAT pilot project with a Ku-band transponder on board INSAT-3A and INSAT-3B. The pilot project was held in few engineering colleges, namely Y.B.Chavan University in Nasik, Armada Institute in Coimbatore, Rajiv Gandhi Technical University in Madhya Pradesh and Visveswaraiah Technological University in Karnataka. Visveswaraiah Technological University (VTU) is the main beneficiary of this pilot project in Karnataka State. Under this pilot project, all engineering colleges of VTU are networked with one hundred nodes.
The State of Karnataka therefore is well geared to use the services of EDUSAT. The Government of Karnataka is working in collaboration with ISRO- the Indian Space Research Organization, EDC- Education Development Council, Washington D.C, USA, Sarva Shikhsa Abhiyan(SSA) and DSERT- the state government’s Department of State Educational Research and Training to implement EDUSAT project. The DSERT has chalked out multi-pronged strategy to realize the objectives of EDUSAT. It has started mobilizing the software and programme content for EDUSAT by conducting workshops and training programmes for teachers, scriptwriters and programme producers in the areas of production of educational video programme and teleconferencing. Teachers are being trained to participate in the live broadcast programmes and in imparting technology-based education. The teachers are being given exposure and hands on training in the use of radio, television and web based learning. The freelancers with the help of teachers have produced the educational content in the form of video programmes and EDC-Education Development Council is contributing educational programmes in good measure. Three places in Karnataka namely Chamarajanagara, Udupi and Sagar have been identified to beam EDUSAT programmes in the form of TV broadcasting and teleconferencing. The primary, higher primary and secondary schools in the districts of Chamarajanagara and Udupi and Sagar taluk will receive the services of EDUSAT once it becomes operational.

Karnataka is the first state in the country to launch the EDUSAT supported primary education project in Chamarajanagar district on March 7, 2005. Under the EDUSAT Distance Education Programme for schools, ISRO along with the Karnataka Government has set up 885 Satellite Receptive Terminals for primary schools in Chamarajanagar District, which is regarded as one of the most backward areas of the state. The project assumes importance as the project of primary education aims to cover the remotest and the predominantly tribal belt of the state where 75 percent of the population is illiterate, in the taluks of Gundlupet, Yelandur, Kollegal, Kannur and H.D.Kote. EDUSAT has started school transmission in March 2005, covering 1, 27,328 students in 885 government schools.
The EDUSAT Distance Education Program for schools is monitored by DSERT- Department of State Educational Research and Training in collaboration with ISRO. The project has been implemented in 885 government schools. The transmission system consists of Satellite Receptive Terminals and one classroom in selected schools with 29'' colour TV set and is operated with solar power. The project seeks active involvement from students and teachers by distributing instructional manual for teachers, as they are required to conduct pre and post telecast activities to enhance the learning outcome. The government has plans to extend this project to the Districts of Bidar and Gulbarga, the most backward places in the State of Karnataka.

In Karnataka State, over 1 million students in the age group of 6-14 years are still out of school. The significance of EDUSAT agenda is to influence the quantity and quality of education imparted at primary, higher primary and secondary schools. The experience of SITE and post-SITE initiatives has given a better platform for the implementation of EDUSAT. Today India is blessed and equipped with the expertise, hardware and software required to use the satellite based communication system.

The state of Karnataka is recognized as the IT capital of India on the basis of its high rate of export of software. It has made great strides in e-governance, tele-medicine and technology supported professional education. Karnataka is also in the forefront in bringing reforms in school education. In 2004 the Government of Karnataka has initiated sweeping changes in primary and secondary education. The state has introduced trimester system from grade III to grade IX from the academic year of 2004-05. This has been done to simplify the examination system. The school education will be project oriented with emphasis on yoga, dance, music, games, art and craft. There is a paradigm shift from exam centric learning to knowledge centric learning. This has been done to arrest the poor learning outcomes of conventional education. The number of books has been drastically reduced to only one per each semester. Each book has been designed to carry the content of three subjects in a judicious manner. Interestingly the state of Karnataka is also in the forefront of making education accessible through
mid-day meals program. All government schools in Karnataka provide free mid-day meals for school children in order to check the heavy dropout rate and to bring back those children who were forced to leave schools for economic reasons.

India has constituted a co-ordination committee under the chairmanship of the Vice Chancellor of IGNOU with representatives from UGC, ISRO and NIEPA to plan and organize the maximum utilization of EDUSAT. Institutions and agencies such as IGNOU, UGC, IITs, IIMs, NCERT, NIEPA and NIOS will be the partners in sharing the time of EDUSAT along with state governments. Plans are afoot to establish up link stations, Satellite Interactive Terminals (SITs), Receive Only Terminals (ROTs) and studios in states as per the requirements all over the country for the operationalization of the satellite. The Committee is responsible to evolve support system, capacity building and content development for harnessing the ICT capabilities of EDUSAT.

The availability of the services of the EDUSAT will pave the way for imparting effective new technology mediated teaching and learning. Since an entire satellite has been dedicated to education, the opportunities for replacing conventional education with technologically mediated education should be explored as nearly 72 channels will be made available in the next three years. There will be tremendous pressure to provide visually based education with greater degree of flexibility and interactivity than mere linear methods of classroom teaching. The EDUSAT is poised to bring better connectivity to schools and revolutionary changes under its footprint in the lives of students, teachers, artisans and farmers alike.

In the information age, EDUSAT would help in building learning environment and infrastructure to provide quality learner-centered education. It will make Tony Bates concept of Distributed learning a reality in Indian education. Tony Bates’ Distributed Learning means, 'a distributed learning environment is a learner-centered approach to education, which integrates a number of technologies to enable opportunities for activities and interaction in both asynchronous and real-time modes. The model is based
on blending a choice of appropriate technologies with aspects of campus-based delivery, open learning systems and distance education. The approach gives instructors the flexibility to customize learning both high quality and cost-effective learning”. 3 Obviously, the application of media convergence is a giant challenge posed by EDUSAT to Indian education. From open education to lifelong learning, EDUSAT is destined to transform education in India via space.

EDUSAT will facilitate convergence of face-to-face mode and distance mode of education demanding better expertise in content development. It will also pave way for transnational education operators in higher education posing tough competition for conventional universities in India. Few years from now India will emerge as the biggest centre of technology-mediated education increasing the demand for content developers and educational researchers to provide quality education.

Thanks to space technology India is poised to produce more human capital armed with education with the realization of universalization of education. S.Prabhakaran, Adviser, EDUSAT, ISRO states that according to a demographic report conducted by a Boston-based institution, by 2050 India will be the largest supplier of trained human power to the world leading to reversal of roles between developed and developing countries. He says that the report has estimated that India will have the largest working population group in the world and in contrast the developed world of today will have more number of elderly and senior citizens.

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