International Journal of Education and Psychological Research (IJEPR)
ISSN: 2279-0179 Volume 2, Issue 2, pp: 23-32, April 2013

EDUSAT Networks in Imparting Efficient Teaching-Learning Solutions

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Abstract: EDUSAT is launched to meet the demand for a satellite based interactive education and supplement to the face-to-face classrooms. The EDUSAT network is capable of transferring various types of data to the remote classrooms. In association with the Indian Space Research Organization, a large number of Indian Universities have established Satellite Interactive Terminals (SIT). The Anna University and Amrita University have established their networks in the southern part of the country. Now, many educational institutions are coming up with the same. This study has analyzed the teaching-learning process of the e-learning networks and its effectiveness among the engineering students. The research reveals that level of awareness and usage of the SIT is satisfactory, but the frequency of usage is very less. Experts feel comfortable with this new teaching platform. Among the students it is getting overwhelming response. SIT videoconferencing has proved more effective and plays a significant role. Proper intimation about the programmes, more interactivity, specialized subjects and adjustment on telecast timings, adding videos, live demonstrations and graphics are needed to make it more useful.

Keywords: EDUSAT, E-Learning, Videoconferencing, Engineering Students, Teaching-Learning

I. Introduction

Major problems in augmenting the education sector are lack of infrastructure and skilled faculty. As large number of students is getting into the professional courses it becomes inevitable to improve the quality of education to compete with the international standards. Targeting the unreached becomes the priority to get the overall development. Urban students mostly get the maximum benefit than the students from the rural area. Technological advancement invariably reaches the creamy layer. To avert the situation, SIT came as a savior. Many Indian education institutions have started trying their hands successfully in satellite education. Government of India is also encouraging the use of the media technologies in the education sector for the teaching – learning purposes. Television, internet, satellites and other personalized gadgets are used effectively by the institutions. Launch of EDUSAT satellite is a landmark (we can call "Sky mark") move by the Indian government.

In 2004, Indian government launched the Educational Satellite (EDUSAT) engineered by the Indian Space Research Organization (ISRO). This is the first Indian communication satellite built exclusively to serve the educational sector. It is mainly intended to meet the demand for an interactive satellite based distance education system in the country. The satellite based interactive narrow casting network has two-way video and two-way audio facility. The network is capable of transferring the data from the teaching end to the receiving end i.e. to the remote classrooms. The data include lecture notes, courseware, presentation material and exercises. The network consists of three major elements: teaching end, remote classrooms and spacecraft. The teaching end consists of a studio and an uplink earth station. The studio, which originates live or recorded lectures, is linked to the uplink earth station. The lectures are transmitted to the satellite and beamed back to earth covering a large geographical area. In the interactive classroom, the students can interact with a subject expert at the teaching end through a voice link via satellite. The students' question and the subject expert's response for that question can be heard live in all classrooms.

ISRO has established a Ku band regional hub consisting of earth station and teaching end studio at Anna University Chennai in the name of Anna EDUSAT (formerly Anna University Technology Development Communication Channel – AUTDCC). This common hub has been networked with a number of Satellite Interactive Terminals (SITs) and Receive Only Terminals (ROTs). The SIT is capable of providing live two way audio video classes where the expert can also see the students in turn at various colleges and interact with them. . Moreover experts from

the colleges can also give lectures from their colleges itself. Around 50 colleges were provided with SITs and they became operational since 2005.

Another teaching end studio is situated at Amrita University, Coimbatore. It is associated with various institutions and universities throughout India. The Amrita teaching end delivers number of videoconferencing classes through EDUSAT. They are bringing subject experts from American Universities. Their receiving end of Satellite Interactive Terminal (SIT) established in about 50 institutions. Many educational institutions are coming up with e-learning and videoconferencing technology. This study was conducted to find out the effectiveness of educational SIT interactive videoconferencing among engineering college students and also identify the new approaches to improve its usage and effectiveness.

II. Background

Apart from the lack of resources and teachers, the traditional teaching-learning methods are becoming old-fashioned in the digital era. Today's students always look out for a change. Innovation and invention grab their attentions instantly. That's why digital resources, e-content, videoconferencing etc., are becoming popular supplementary technologies for the conventional method of teaching and learning. These supplementary technologies are being adopted by various urban educational institutions which are result yielding andgrab the attention. They are well received by the students as they generate interest among them. Reference [18] says that e-learning to the use of internet technologies to deliver a broad array of solutions that enhance knowledge and performance. It is based upon three fundamental criteria are networked, delivered to the end-user via a computer using standard internet technology and focuses on the broadest view of learning.

The term E-learning comprises a lot more than online learning, virtual learning, distributed learning, networked or web-based learning [16]. He also added that, e-learning would incorporate all educational activities that are carried out by individuals or groups working online or offline, and synchronously or asynchronously via networked or standalone computers and other electronic devices. With its unique features e-learning is an experience that leads to comprehension and mastery of new skills and knowledge. As a result educational institutions, universities and organizations worldwide now offer online courses, training and continuing education programmes.

E-learning is a way of education that incorporates self-motivation, communication, efficiency and technology. Because there is limited social interaction, students must keep themselves motivated. The isolation intrinsic to E-learning requires students to communicate with each other and the instructor frequently to accomplish their assigned tasks [6]. Distance is eliminated by the E-learning, because the contents are designed with media that can be accessed from properly equipped computer terminals and other means of Internet accessible technology.

E-learning that's happen synchronously or asynchronously. Synchronous, means at the same time, involves interaction of participants with an instructor via the electronic in real time. Synchronous e-learning, commonly supported by media such as videoconferencing and chat, has the potential to support e-learners in the development of learning communities. Learners and teachers experience synchronous e-learning as more social and avoid frustration by asking and answering questions in real time. Synchronous sessions help e-learners feel like participants rather than isolates. According to Reference [14], Synchronous learning comes to the rescue of students facing geographical barriers, by aiding face to face interactions with the instructor, physical constraints no bar. It has been observed that most learners find it difficult to learn without real time conversation with either the instructor or peers.

Asynchronous, which means not at the same time, allows the participant to complete the learning at his own pace, without live interaction with the instructor. Asynchronous learning is learning that happens independent of time and space. Learners are able to interact with course materials and with each other at a time of their choosing. A discussion thread is an example of an asynchronous learning. Learners can engage each other when it is most convenient and a knowledge trail is left of discussions. Asynchronous e-learning, commonly facilitated by media such as e-mail and discussion boards, supports work relations among learners and with teachers, even when participants cannot be online at the same time. It is thus a key component of flexible e-learning. Asynchronous e-learning makes it possible for learners to log on to an e-learning environment at any time and download documents or send messages to teachers or peers [14].

As a synchronous learning model videoconferencing provides students with the opportunity to learn by participating in a 2-way audio-video communication platform. Furthermore, teachers from all over the world can be brought to classes in remote or otherwise isolated places. Students from diverse communities and backgrounds can come together to learn about one another. Students are able to explore, communicate, analyze and share information and ideas with one another. Small educational institutions can use this technology to pool resources and teach courses which could not otherwise be offered. Videoconferencing can benefit people around campus. Faculty member keeps in touch with class; Visiting faculty brought into a class from another university. Research scholars collaborate with experts and peers at other institutions on a regular basis without loss of time due to travel.

A videoconference is a set of interactive telecommunication technologies which allow two or more locations to interact via two way video and audio transmissions simultaneously. Conference between two or more participants at different sites by using computer networks to transmit audio, video data. As the two participants speak to one another their voices are carried over the network and delivered to the others speakers and whatever images appear in front of the video camera appear in a window on the other participants monitor. Videoconferencing provides a means to get both students and tutors to a central location, all be it virtually. In Australia the introduction of videoconferencing has helped rural institutes expand by 500%. Fundamental components in virtual environments are conceptualization this refers to the contact the learner has with other peoples' views/thoughts on a subject. When the technology became available was to move to visual and audio communication, after all face to face interactions had been shown to be more effective than audio-only interactions [3].

Reference [9], describes efforts to introduce desktop videoconferencing into four schools at Virginia in the US, was working with four science teachers. The focus was the support of distributed collaborative learning between science classrooms, but initially technical difficulties dominated the project. Once these were overcome, a number of educational issues came to the front. While most students are interested in videoconferencing, some are only passively interested. Many of the most active and competent videoconference users were those students who were often hampered in school activities by poor literacy skills. Not all students are comfortable with videoconferencing and some may feel very self-conscious. The educational value is highly dependent on the suitability of the collaborators and the basis for the collaboration. The researchers also felt that the technical and organizational issues surrounding videoconferencing may hinder widespread acceptance by teachers.

Reference [12] said that Indo-US inter-university Network for Higher Education and Research was launched in 2005, collaboration between over 20 American universities and Amrita University, The Indian Space Research Organization (ISRO) and the Department of Science and Technology (DST) to enhance higher education and research in India through the Edusat e-learning network. This network is working effectively.

A study was conducted by Reference [2], to assess the postgraduate student reactions to a course taught by videoconference as opposed to a traditionally delivered course. Two sections were taught, one to 28 students on campus in a conventional setting, and a second to 12 students in four different cities via videoconference. Each section followed the same syllabus, and used the same assignments and projects. Students completed evaluation forms covering five main areas: instructor preparation, presentation methods, class time utilization, instructor-student communication and evaluation methods. Data showed that students receiving the course via videoconference were as satisfied with the teaching as those present with the instructor, and indeed they felt extremely positive about this delivery method. The results indicated that one key to success in distance learning is the instructor, who must be thoroughly trained in the technology, demonstrate polished presentation skills, create opportunities for interaction, develop appropriate materials and use media effectively. Consequently it may take significantly longer to prepare for sessions taught by videoconference. Recommendations are made for instructors [4], denoted from the above studies. A positive learner comment from the Garland/Laranger study was that "it saves students travel, the university from duplication of courses at various sites, and it provides an interaction of ideas from various regions". The concept of distance education is that there can be effective learning environments other than the traditional classroom [15].

In a study, Reference [20] explored successful adoption of new technologies. Children with special educational needs from three Welsh secondary schools were linked by videoconference sessions. Conferencing took place every week, with each group being able to access the link once a fortnight. The main aim was to improve students' social skills through facilitating contact with others in similar situations. Data was collected through interviews with staff

and students, observations, student logs and questionnaires. Main findings were that Social and communication skills were developed, as most strongly evidenced in speech development; The technology proved a good motivator, specifically for getting six unenthusiastic writers to use a keyboard, but all found using the system exciting and teachers reported that it helped in inspiring all students to work; As a result it is suggested that videoconferencing does have a future in education, but particularly in areas where teachers and children work in small groups, interactively, within a flexible timetable. Consequently, an obvious application would be in overcoming rural isolation in small primary schools.

Reference [7] found that the UK and German universities linked up in a study examining the features of interaction during a videoconference. The basis for this was a role play exercise. Students filled out pre and post videoconference questionnaires, and also gave feedback during discussions. Tutor comments were collected. A lack of empathy between students in the two locations was observed, and a strong 'them and us' attitude grew up. The UK students became extremely competitive, and even aggressive towards their German counterparts. Most students reported that it was a useful learning experience, but the researchers felt that the communicative effects of the medium worked against conventional language class teaching and natural group discussion.

Reference [21] was conducted a study at the University of Ulster. All the students were together at one site, the lecturer at another. The group size never exceeded 12, and the first two classes were held by the lecturer in person, to develop group rapport. The most positive outcome was the social cohesiveness of the group, the physical absence of the tutor helping students to express their own views with less inhibition. Student evaluations also showed high levels of satisfaction with elements of pre-planning, such as the advance dispatch of presentations by post. At De Mont ford University students are present at both sites (one with the lecturer), and taught simultaneously. 20 sessions were analyzed. The largest session comprised 15 at one site and 14 at the other. There was substantial dissatisfaction amongst students with aspects of interaction - difficulty in communicating, poor sound quality, hostility towards the remote group and shyness were all reported. While videoconferencing may be a way to extend access to learning, it seems most suitable for activities where little interaction is required.

In a study Reference [5] explores the effectiveness of distance learning and multimedia technologies in facilitating an expanded learning community between two teachers and their students in geographically separated schools. The teachers developed curricular activities and identity-forming multicultural activities for their 5th-8th grade students. They participated in collaborative activities and shared multimedia files via interactive videoconference. The researchers discovered that the participating teachers developed empowering multicultural relationships while their students developed multicultural understanding and positive self-concept. This was demonstrated by, amongst other things, raised levels of academic aspirations and heightened poise during public speaking.

Reference [19], describes how multipoint desktop videoconferencing is used in initial teacher training programmes in Singapore. Weekly conferences are held between university supervisors and student teachers from five different schools. This has been done with three successive cohorts of 59 student teachers who were seen to benefit in a number of ways: Sharing of ideas, problems and solutions, Availability of immediate feedback, Peer support reduces stress levels for some teacher trainees, Communication barriers between student teachers and supervisors have been broken down, with students being more willing to engage in frank discussion than they were during face to face meetings. In a further experiment, two students videotaped each other teaching. The videos were put on a web site for all students to view prior to a conference at which they were able to share their peers' experiences. Students responded positively to this.

Reference [13], opined videoconferencing is widely used in higher education for the delivery of lectures between sites, but there is concern that the quality of teaching and learning may be poorer than that experienced in a traditional classroom. This 10 week study investigated the classroom activities and cognitive outcomes amongst a group of 66 Masters Students, of whom 45 were local site students and 21 remote site students. It was found that the local students were receiving more information and explanations from the lecturers, reading and reviewing material more, working in groups and making presentations more than the remote students. Local students also reported a higher occurrence of learning in 10 of the 15 cognitive outcome categories. There is discussion of possible reasons behind these differences, including the significance of physical access to the lecturer, and feelings of isolation emanating from a lack of eye contact with the lecturer. The quality of teaching and learning is not the same in a

course delivered by videoconferencing, but the medium itself is not entirely responsible: inexperience, bad preparation and planning, and inefficient training on the part of the facilitator can also have an influence.

According to Reference [8], those using assistive technology to help with complex physical and communication difficulties require constant support in its use. The telenet project evaluated its effectiveness of videoconferencing in the provision of support, assessment and training by the ACE centre to remote teams of support professionals. 86 sessions took place and participants were asked how successfully they felt their aims for the session were realized. Outcomes of the project shows that increased knowledge, confidence, expertise and motivation, perception of ace centre teams as colleagues; Raised local profile and increased authority stemming from their collaboration with ace. In addition there were the expected savings in time and travel, but also the involvement of professionals such as consultant pediatricians who are normally very rarely seen at child-related sessions, but were attracted by the convenience of being able to drop into a session at short notice.

Reference [10], explained that use of videoconferencing to contribute to the enrichment of mathematics in schools, and to give students an idea of how practicing mathematicians use mathematics in their working lives. It also provides students with a real audience for presentations, and gives them an experience of collaborative working. Students complete a preliminary task, and during the first videoconference they take part in activities and discussions, listening to the ideas of other schools. In a second session they work on projects involving areas of mathematics which are unfamiliar to them, requiring full engagement in mathematical activity. It was found that teachers valued: The opportunity for students to work independently; Collaboration between students as they work on problems beyond the normal curriculum; Presentations of work given by students to a real audience. In turn, the students valued: The variety brought to mathematics teaching; the chance to communicate with others by giving presentations; Being able to discuss problems in mathematics.

In a study found that, Most of the students are aware of the EDUSAT videoconferencing and a majority of them using it. They responded that EDUSAT interactive sessions are very useful for getting deeper knowledge on the subject and more score in the examinations. It provided more chances more interacting with experts. In China, Reference [11] found in their study, the students in China admitted significantly that such videoconferences are useful for exchanging opinions with foreign students. The review of the literature is strongly indicated that the e-learning through various modes including videoconferencing is very effective and useful to the student community.

III. Methodology

Research methodology is a way to solve the research problem systematically. This study has adopted the survey method with a self-administered questionnaire tool and field observation. A well-designed questionnaire was circulated among the students of various engineering colleges in and around Chennai who utilized the services of SIT especially "Anna Edusat" Anna University Training and Development Communication Channel (AUTDCC) and Amrita e-learning network to gather information on the usage and effectiveness of videoconferencing. Sample size was 200. Sampling is a part of Statistical practice concerned with the selection of individual observations intended to yield some knowledge about a population on concern, especially for the purpose of statistical inference. The type of sampling used in this study is cluster sampling. It involves grouping the population and then selecting the groups or the clusters rather than individual elements for inclusion in the sample. Under cluster sampling we first divide the total area into a number of smaller non-overlapping areas, generally called geographical clusters, then a number of these smaller areas are randomly selected, and all units in these small areas are included in the sample. About 10 colleges were selected in the Chennai region. 20 students from each college were chosen for the data collection which includes 50 percent for male and 50 percent for female. In total 200 students were surveyed for the purpose. Observations were done in few locations that mean engineering colleges with the facility of EDUSAT videoconferencing. The researcher was personally visited the SIT (Satellite Interactive Terminals) and observed the proceedings.

IV. Results and Discussion

Results of the survey is presented and discussed here with different variables. This section provides a serious insight of the videoconferencing based education.

Awareness on EDUSAT Videoconferencing among the Students:

The engineering students are using large number of new technologies including computers, internet, videoconferencing, etc., for their learning purpose. This study aimed to know the awareness level of the EDUSAT videoconferencing among the students. The data exposed that most of the students (63.5%) are aware of the EDUSAT videoconferencing. Only 36.5% students are not aware of it. These colleges have the EDUSAT SIT facility with a considerable investment. They also face shortage of teachers. So the students are engaged to devote at least a few hours for the videoconferencing.

Usage of EDUSAT Videoconferencing:

The students are using various types of information communication technologies for their educational purpose. EDUSAT videoconferencing, Internet and Television are generally used media by the students based on the availability. Data shows that EDUSAT is the top most medium used by the students. Data from the table 1 reveals that, 60% of the students are using the EDUSAT Videoconferencing for the educational purpose. Followed by Internet EDUSAT is the second preferred medium by the students (52%) and Television comes last (37%). Students use EDUSAT in the class room whereas they use Internet outside classroom to do their assignments. Regarding television, they watch educational channels like Discovery, National Geographic, Gyandarshan, Doordarshan, etc., at their leisure time.

Table-1. Usage of EDUSAT Videoconferencing and Students

Medium	Frequency	Percentage	Total
EDUSAT	120	60%	200
Internet	105	52.5%	200
Television	75	37.5%	200

Attention Level of the Students on EDUSAT Videoconferencing:

A good teaching method should grab the attention of the students easily. Data from the table 2 explores that EDUSAT Videoconference grabs more attention (48.5%) than Internet (44%) and television (23%). The attention level of the students in a videoconferencing system is high due to self-interest, synchronous nature and technical compulsion.

Table 2. EDUSAT Videoconferencing and Attention Level of Students

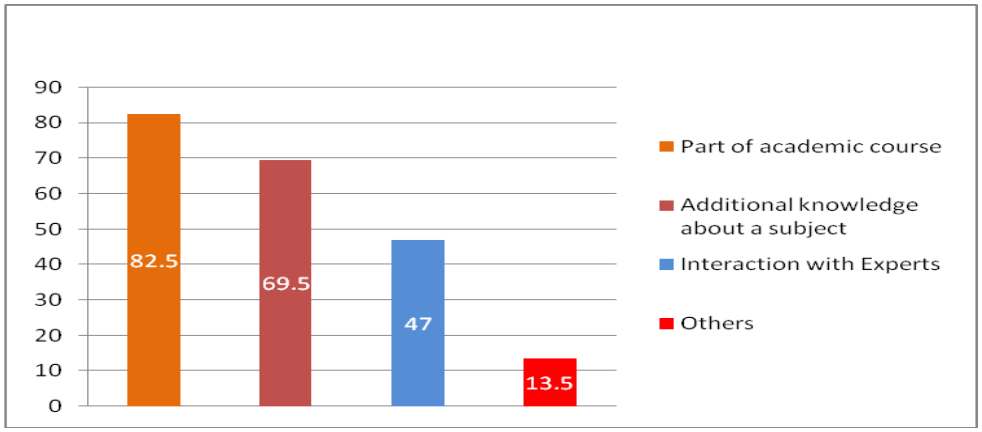
Media	Frequency	Percentage
EDUSAT	97	48.5%
Web Based	89	44.5%
Television	47	23.5%

Purpose of the Usage of the EDUSAT Videoconferencing:

Technology can be a boon or bane. It can be either used or misused but as far as EDUSAT is concerned the usage is purely academic as it has been monitored by the academicians. Most of the students (82.5%) said that the

videoconference is very useful and gives knowledge (see the Fig.1). About 69.5% of the students said it is providing additional knowledge about a particular subject. 47% of the students said the videoconferencing provides opportunity to interact with the external experts. The EDUSAT SIT is completely devoted to the academic development of the engineering student. Since the expertsare from various disciplines of engineering, students reap the maximum benefit.

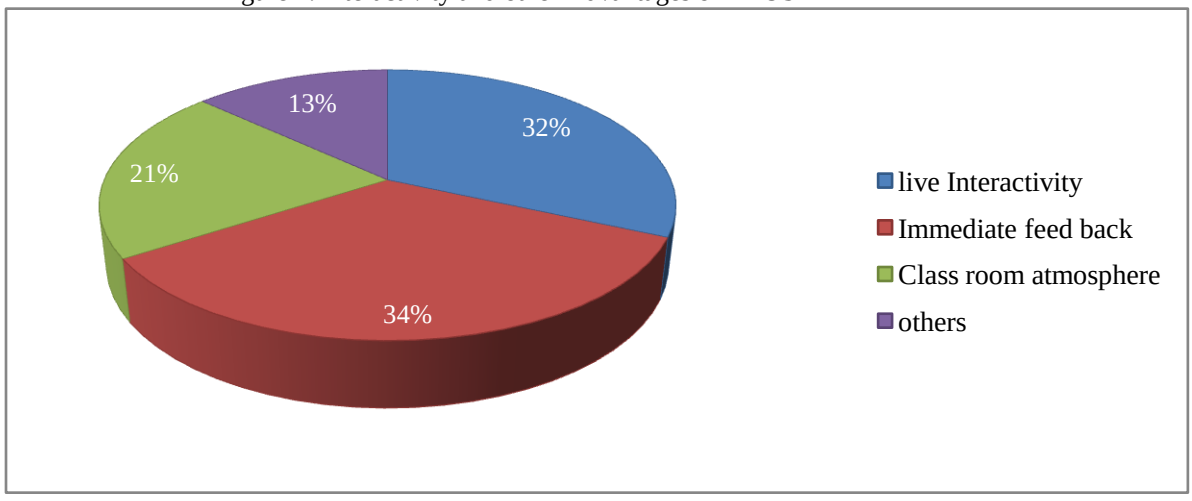
Figure 1. Purpose of the EDUSAT Videoconferencing among the Students



Interactivity and other Advantages of EDUSAT Videoconferencing:

Regarding the advantages of the EDUSAT videoconferencing, (34%) of the students stated that they got immediate response/reply from the experts, 32% of the students said it provides scope to interact, 21% of the students said the videoconferencing gives class room atmosphere and 13% of the students said some other advantages (see the Fig.2). Since the students get their doubts clarified straight away it gives them class room ambience. Moreover, Expert's appearance, facial expressions, interactions are also act as controlling mechanisms among the learners. Because of EDUSAT, distance is completely dead in the teaching-learning process

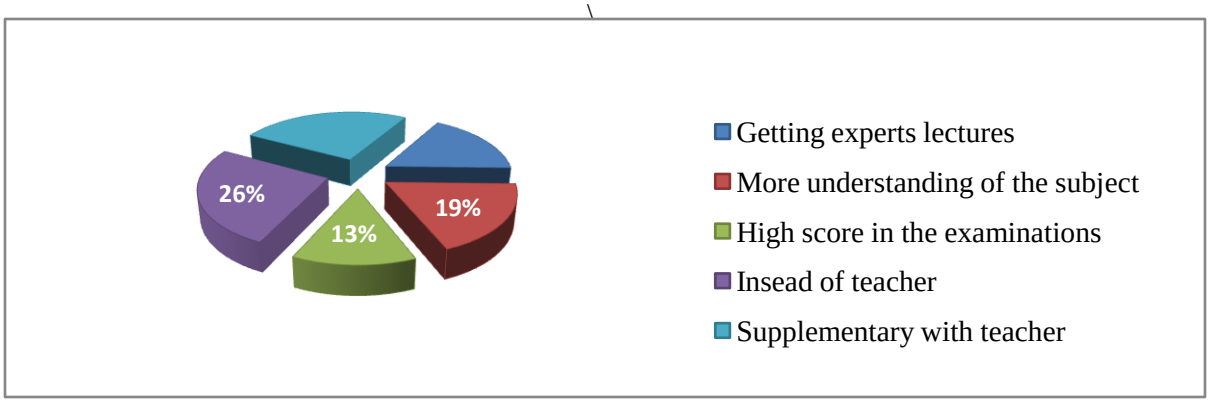
Figure 2. Interactivity and other Advantages of EDUSAT



Benefits of the EDUSAT Videoconferencing:

With regard to the benefits, the figure 3 explored that, 25% of the students said it is a supplement to their regular teaching mode. 26% of the students said that the program is very useful as they have /shortage of teachers in their institutions. 17% of the students said it is a chance to hear lectures of the brainy experts from different stream. 19% of the students said it gives more understanding of the subject. The videoconferencing gives more enjoyable learning opportunities to the students.

Figure 3. Benefits of the EDUSAT Videoconferencing



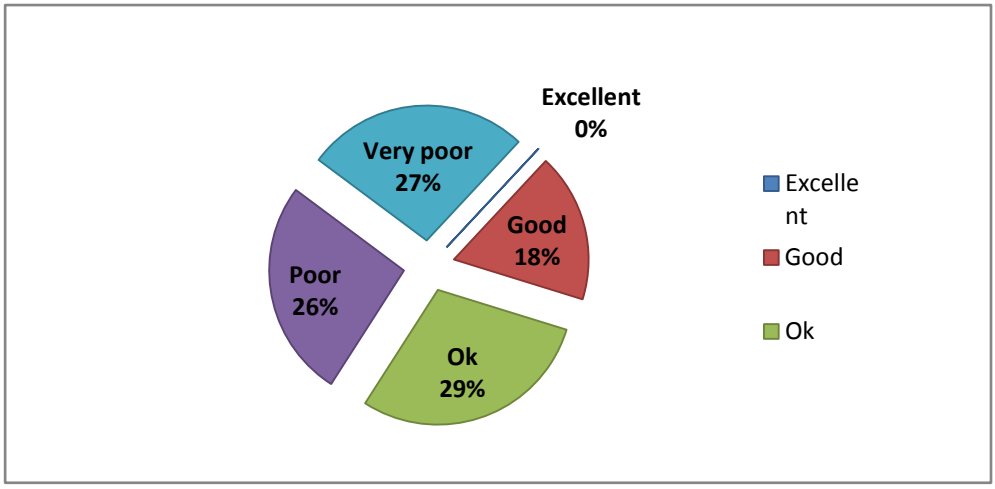
Motivation by the EDUSAT Videoconferencing:

In the aspect of motivation, most of the students (61%) felt that the videoconferencing is not motivating them; only 39% of the students said it is motivated them. Reason might be the experts use simple Power Point presentations/white board for the videoconference sessions. It ends up in delivering a monotonous lecture which the students feel less motivated. The experts should equip themselves in handling the technology in a better way. Another major challenge is, experts cannot give individual attention

Quality of the EDUSAT Videoconferencing:

Quality of the input is always important for each and every teaching-learning activity. Otherwise the purpose will not be served. Data from the fig.4 shows that, only 18% of the students feel EDUSAT videoconferencing has got good quality, 29% of the students said it is satisfactory, 26% of the students said it is poor and 27% of the students said it is very poor. None of the students said it is excellent.

Figure 4. Quality of the EDUSAT Videoconferencing and Students



Subject specialization of the EDUSAT Videoconferencing:
Specialization is important for getting more and deep knowledge on the subject. Delivering specialized lectures will provide better understanding among the students. Data shows that more number of students (94%) is asking for classes on specialized and advanced area of the subjects. But that is not given to them.

V. Findings and Conclusion

The study reveals that most of the students (63.5%) are aware of the EDUSAT videoconferencing. It is the top most medium used by the students. 60% of the students said that they are using the EDUSAT Videoconferencing for the educational purpose. Followed by Internet, it is the second preferred medium by the students (52%). EDUSAT videoconference grabs more attention (48.5%) than any other media. Most of the students (82.5%) said that the videoconference is very useful and gives knowledge as part of the regular subject. About 69.5% of the students said it is providing additional knowledge onthe subject. 47% of the students said the videoconferencing provides opportunity to interact with the external experts.

Regarding the advantages, (34%) students stated that they got immediate response/reply from the experts, 32% of the students said it provides more interaction, 21% of the students said the videoconferencing gives class room atmosphere and 13% of the students said some other advantages. With regard to the benefits 25% of the students said this is a supplement to their regular teaching mode. 26% of the students said that the program is very useful as they do not have adequate teachers at their institutions. 17% of the students said it is a chance to get more interaction with the experts. 19% of the students said it gives more understanding of the subject.

In the aspect of motivation the videoconference`e is less effective. Most of the students (61%) said it not motivating them to learn as the most of the experts is using simple Power Point presentations/white board for the videoconference sessions. Regarding the quality of the EDUSAT videoconferencing, only 18% of the students said it is good, 29% of the students said it is satisfactory, 26% of the students said it is poor, 27% of the students said it is very poor. More number of students (94%) asks for classes on specialized and advanced area.

Presently the experts are using either the white board or power point slides for their presentation. It's similar to the conventional class room except that the students sitting in the remote place. More interactions with the usage of animations, graphs and more video clippings are important. The telecast timings of EDUSAT network must be adjusted with the user requirements to make it more effective. Video clippings covering industrial activities, live demonstrations can substantiate the lectures to make it livelier. The educational interactive videoconferencing programs are effective and interactive among the students; but needs to be modified as per the suggestions give above to make it students friendly and also to create an impact on the teaching-learning methods. A proper intimation to students should be given through emails, and colleges. Graphical presentations should be added in the audio visual presentations.

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