

# Edusat Satellite Based Education: Study of Scope for Enhancement of Audio-Video Quality- A Case Study of Madhya Pradesh Bhoj (Open) University

Daulat Singh, Shiv Kumar, Rakesh Shrivastava, Dinesh Varshney

*Abstract- Edusat Satellite is the satellite dedicated for fulfillment the needs of education and its effective usage requires a network comprising Hub, Teaching End (Studio) and Receiving Terminals. The present study is related with Edusat-network of Madhya Pradesh Bhoj (Open) University, which includes Hub dedicated for higher and distance education, Studio and 40 Satellite Interactive Terminals with Edusat-network provided by Indian Space Research Organization (ISRO). These SITs have been installed in urban, rural and tribal areas. Detail study of equipments of hub, studio and receiving terminals was taken up. Target group was chosen and most easy and suitable way of virtual class was identified. Various factors affecting quality of audio/video were drawn from the study and content/presentation of video lectures were analysed. Recorded video lectures and live lectures were telecasted for 177 working days and observations related to BER (Bit Error Rate) correlating problems encountered during operation of terminals, audio-visual quality of lectures, skill and response of operators were made. We aimed at identifying the scope of enhancement in audio-video quality of the material telecasted through Edusat. The study is based on the network which has been created mainly for the students of rural and tribal areas. On the basis of observations and BER data collected from hub, the present study makes findings and suggests those possibilities which can enhance the audio-video quality of the telecast without any major change in satellite's band width and hub, and with minimum increase in cost and expenditure.*

*Keywords- Edusat- Satellite dedicated for education, SIT- Satellite Interactive terminals, BER- Bit Error Rate, RCST- Return Channel Satellite Terminal, LNB- Low Noise Block down converter, GCU- (Gateway Cannel Unit), Gramsat- Satellite based project for villages, TDCC- Training and Development Communication Channel.*

## I. INTRODUCTION

Education is not only the right of persons or students belonging to particular age group, but it is a need or desire of every one living in country or on the earth. Each individual and each individual's personality play an important role in building of nation.

Our formal institutionalized system of education is gradually improving and changing to compete with globalization, however working in less infrastructure, increasing number of students and greater proportion of students in rural and tribal areas are still prominent

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challenges of education. In the age of globalization and information, the nation faces challenges of education on several fronts, namely, adult and continuing education, school education, higher and professional education.

The challenge varies not only from one level to another, but also from one region to another with gender disparities, rural-urban disparities, etc. These challenges have been and are being addressed on a continuous basis, making use of the best that technology has to offer at any given time. Communications technology, particularly, space based communications networks, is a very important component of these technologies (Palsule, 1986).

Government is coming up with number of universities, deemed universities, colleges and autonomous institutes to fulfill the need of student. Launch of Edusat on 20th Sept, 2004 is another revolutionary step in the field of education. Edusat, the satellite dedicated for education is capable of catering the educational needs at all levels of formal and distance education, in 16 different regional languages. The present paper aims to suggest some possible techniques of enhancement of quality of audio and video of virtual class and telecast of recorded video lectures through Edusat. A network of 40 Satellite Interactive Terminals covering students of urban, rural and tribal has been studied and analyzed in terms of techniques used, quality of audio/video and role of co-ordinators, operators and users.

## II. MAIN FEATURES AND TECHNOLOGY OF EDUSAT

The need for simple cost effective but more powerful satellite remote terminals calls for very powerful transponders on the satellite and the large number of wide band channels indicates the need to move to the higher frequency bands such as the Ku band. Thus Edusat is a satellite constellation which carries five Ku band transponders providing spot beams, one Ku band transponder providing a national beam and six extended C band transponders providing national coverage beams.

Following are some of the major parameters of EDUSAT (GSAT-3) transponders (Bhaskaranarayana et al. 2007):

- A total of 6 FSS C-band transponders, which will operate in upper Ext. C-band.
- A total of 6 FSS Ku-band transponders and
- A Beacon operating in Ku-Band.
- The coverage contours on earth's surface are,
- Indian Coverage of C-band (ICC) Beam will be over Indian geographical Boundary.
- Ku-band National beam will be over Indian mainland region.

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- Five Ku-band spot beams (Ku-South, Ku-West, Ku-Central, Ku-NE, Ku-North) will be over Indian mainland region.

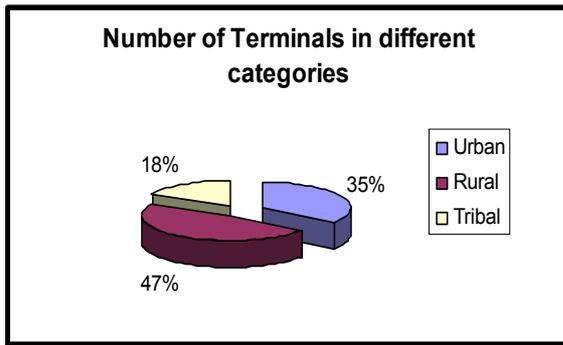


Figure-A

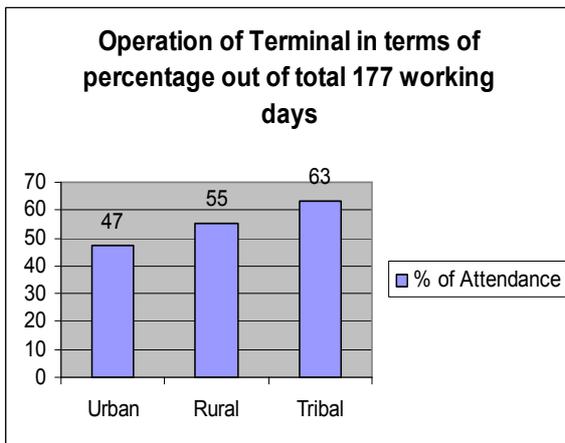


Figure-B

- The national extended C band beam to provide continuity of service for existing TDCC and GRAMSAT users.

The Edusat network of present study comprises of one Hub, 40 Satellite Interactive Terminals and one Teaching end or Studio configured in extended c-band. The transmission and reception of class/lectures and other educational programme through Edusat Satellite works on MF-TDMA (Multi Frequency Time Division Multiple Access), TDMA, mesh and Star technology. The network of present study uses the star technology (Agrawal 2004 and Bhaskaranarayana *et al.* 2007).

### III. METHODOLOGY AND SAMPLING

Forty representative locations of Madhya Pradesh were chosen for establishing Satellite Interactive terminals, selecting 14 from urban, 19 from rural and 7 from tribal area (Table-1, Figure-A). Figure-B presents the response of urban, rural and tribal areas in terms of percentage calculated on number of operational days out of 177 working days. Schedule of Recorded Video lectures and live lectures was prepared. Regular telecast of lectures was made for 177 working days (July-07 to May08) and data related with site up/down, BER, technical problems and response of operators were collected. The network was made operational by linking study centres with Studio and Hub. Lectures in selected topics/subjects where there is a shortage of quality faculty were telecasted. The hub dedicated for higher and distance education, the studio (teaching end) and 40 SITs were established by ISRO. Thus setup has its own up linking and studio facilities in an exclusive building. The selection

of students, class, syllabus, and mode of virtual class (recorded video lectures and live lectures) is the part of this study. Mainly the students of Part-one bachelor course and some students of MSW and PGDHN were chosen for this study. Table-2, presents the number of students participated in Edusat Satellite based education programme.

The recorded video lectures were telecasted from the studio of Madhya Pradesh Bhoj (Open) University every Monday to Thursday (July-07 to May-08) 11.00 am to 01.00pm and repeat telecast from 03.00 pm to 05.00 pm. Live lectures were telecasted on every Friday From January,08 to May,08. Table-3 presents a sample of schedule of telecast for the month of March, 2007. The data of the period July-2007 to May-2008 has been taken as observation for this study.

#### (A). Video lectures:

The main target groups for this study are the open distance learners from rural and tribal areas. Initially few capsules of video lectures were prepared and run through Edusat and out put at remote end were critically examined (as per factors mentioned in Table-4) by team of experts. Learning capacity of the learners was compared with other mode of teaching technology. Based on the observations, therefore recorded video lectures and live lectures were considered as most effective initial use of Edusat for selected target group of learners. A team of experts selected topics, prepared guidelines for script writing and for graphics, figures and visuals. Power point presentation was taken as principal tool for explaining the content. All content presenters were given five days training for studio based video lectures and live lectures. One topic (preferably a hard spot from the syllabus) was converted by content expert into lecture of one hour duration. This lecture of one hour duration was shoot and recorded into two parts of half hour duration. Both parts of lectures were telecasted with interval of 5 to 7 minutes. Second part of the lecture necessarily contained some objective type questions on content delivered. Live lectures of every Friday were also planned in the same manner. High quality studio of National Institute of Technical Teachers' Training and Research (NITTTR), Bhopal was used for shooting of video lectures, editing and making final output in the form of DVDs.

#### (B). Operation of Hub:

The equipments, operation and working technologies of Hub setup by ISRO, were studied. In Edusat network Hub transmits the signal to satellite and receives the signal from remote site. Hub equipments are of two types the Out Door Unit (ODU) which mainly comprises the 4.5 meter antenna, Block up Converter (BUC), Low Noise Block down Converter (LNB) and GPS antenna and the In Door Unit (IDU) which mainly includes Modulator, L- Band converter, Router, IP encapsulator, Gateway channel unit (GCU), Time division Unit (ITDU) NMS server and L-band splitter. The indoor unit is mounted in a rack named as Hub Rack (Figure-C) ([idsp.nic.in/idsp/UserManaula/ModuleB.pdf](http://idsp.nic.in/idsp/UserManaula/ModuleB.pdf))

The outbound uplink frequency of hub is 6778.32 MHz and outbound downlink frequency is 4552.00 MHz, where as inbound uplink frequency for remote is 6780.04 MHz and inbound downlink frequency is 4555.04 MHz. Outbound data rate from the hub is 1.2 MBPS and 768 Kbps and for return channel it is 0.8 MBPS and 364 Kbps. All operations and working of the Hub is monitored and

network is controlled through Network Management System (NMS), Personal Computer, directly connected to the router of the hub.

Figure-D and E represent the techniques/mechanism behind the operation of hub, its communication with SITs and transfer of data (Pandey, 1999).



Figure-C

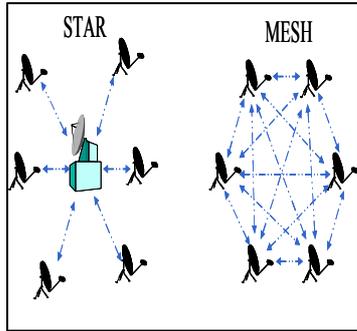


Figure-D

Figure-E

**Figure-C:-** Edusat Hub Rack, assembled and in operation

**Figure-D:-** Star Topology, that is two way communication from each remote site to hub. Inter remote site communication is not possible in this mechanism. In other words is an intra net technology.

**Figure-E** Mesh Topology, that is VSATs or remote sites communicate directly with each other; Hub is involved only for call setup.

**(A) Studio:**

It is the main part of the Edusat network from where recorded video lectures, live lectures, any other e-content or educational programme are prepared and made finally ready for telecast. In satellite-based education Studio is turned into virtual classroom. The Edusat studio setup given by ISRO includes three main Personal Computers, two Cameras, Audio mixer, Video mixer and DVD Player with audio transmitter and receiver. Out of three computers in studio one is video server, second is LMS (Learning Management System) server and third is presentation PC. Video server and LMS Server are operated through TrainNet software which executes all the functions regarding audio, video and data. The entire configuration like frame rate (15-25 frame per second) and data rate (768 Kbps and 512 Kbps) of video

is upgraded by this sever and it is done manually. Presentation PC is used by content presenter to see his/her performance in camera. The cameras and TrainNet software are two important instruments which mainly control the video quality of the content. Therefore specifications of cameras and features of TrainNet software were studied in detail (Table-5)

**Table-5:** Specifications of Camera and TrainNet Software

Camera	
Features	Specifications
Image Gross:	Approx. 380000 pixels
Effective:	Approx. 230000 pixels
Video signal:	PAL, CCIR Standard
Lens:	20× (optical), 990×digital
Focal Length:	2.5-50 mm (1/8-2 in.)
Audio/Video-Output:	AV MINIJACK
TrainNet Software	
Main Application features	Details
Attend:	Login to a lesson, leave a lesson, or exit the TrainNet Student application.
Request to Speak:	Display or hide a text box in which you can type a question, answer or comment, and send it to the teacher.
Positive Feedback:	Send positive feedback to the teacher, for example when the teacher asks a Yes/No question

The studio is connected with the hub through cables. All cables from studio are connected with router, mounted in hub rack. Router is directly connected to 3-com switch which is equally shared by three personal computers, mentioned above as Video server, LMS sever and Presentation PC. Audio received by receiver and video captured by video camera is mixed in audio and video mixer separately and via OSPREY card it is sent to router through CAT-6 data cable which is connected to three PCs. This setup is explained in Figure-F.

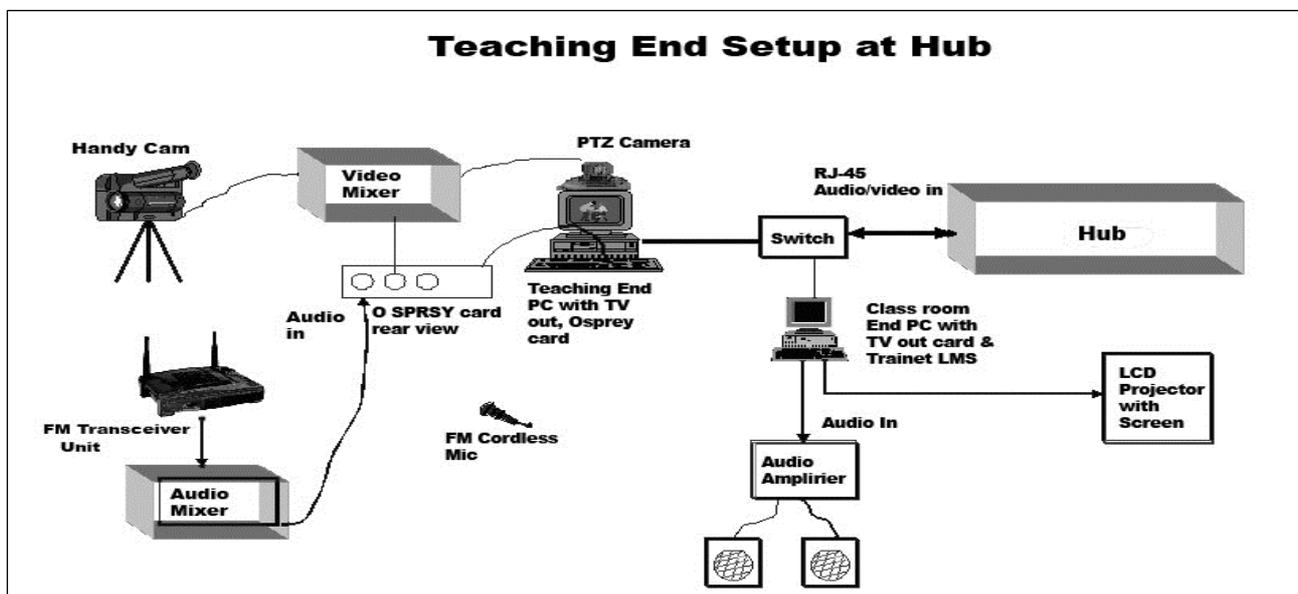


Figure-F Linking of Teachind End (Studio) with Hub.

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## (B) Satellite Interactive terminals (SIT):

In Edusat network language they are also referred as remotes or VSATs. In present study, the geographical locations of 40 SITs are shown in Figure-G. They are basically the study centres of Madhya Pradesh Bhoj (Open) University where SITs of Edusat have been installed to link them with Studio through Edusat satellite. Video lectures or Live lectures (Virtual class) i.e. audio/video data is transferred by hub in the form of electric signals to Satellite and received in the SITs. Two way audio-video communications is the main feature of Satellite Interactive Terminals. Like hub SITs also have outdoor unit comprising the antenna and RF transceiver (Transmitter + Receiver), and indoor unit comprising RCST (Return Channel Satellite Terminal), Projector with screen, Computer with in built Osprey device, handheld mic with receiver and transmitter, Handycam and UPS. Setup and working of Satellite Interactive terminals are shown in Figures-H and I.

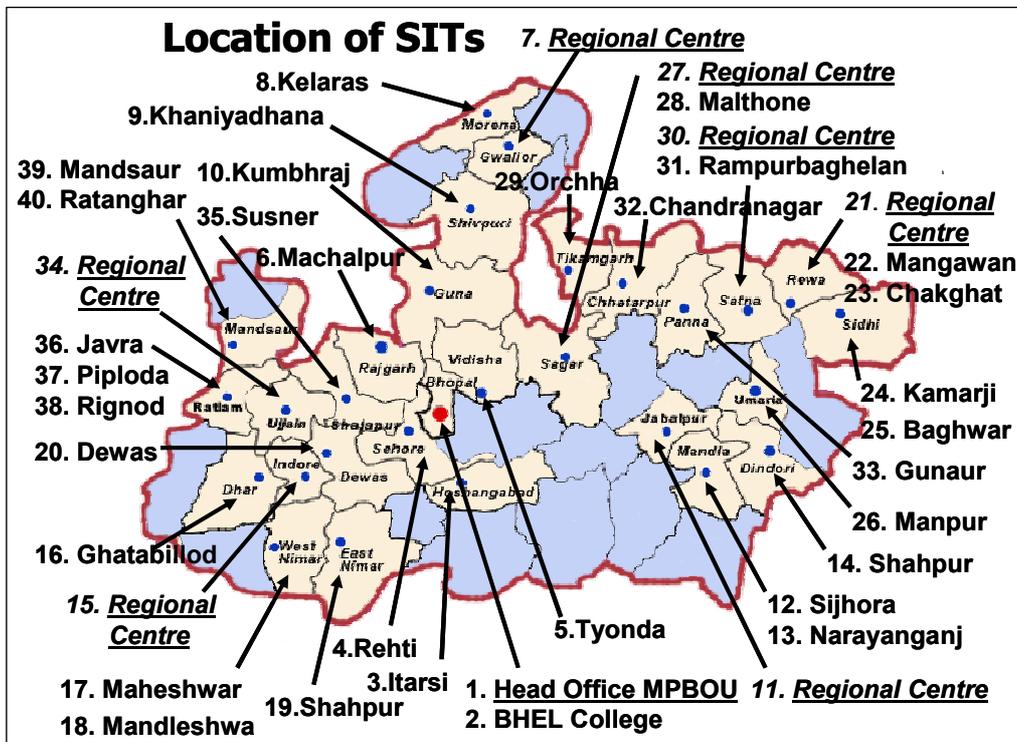


Figure-G Geographical locations of Satellite Interactive terminals

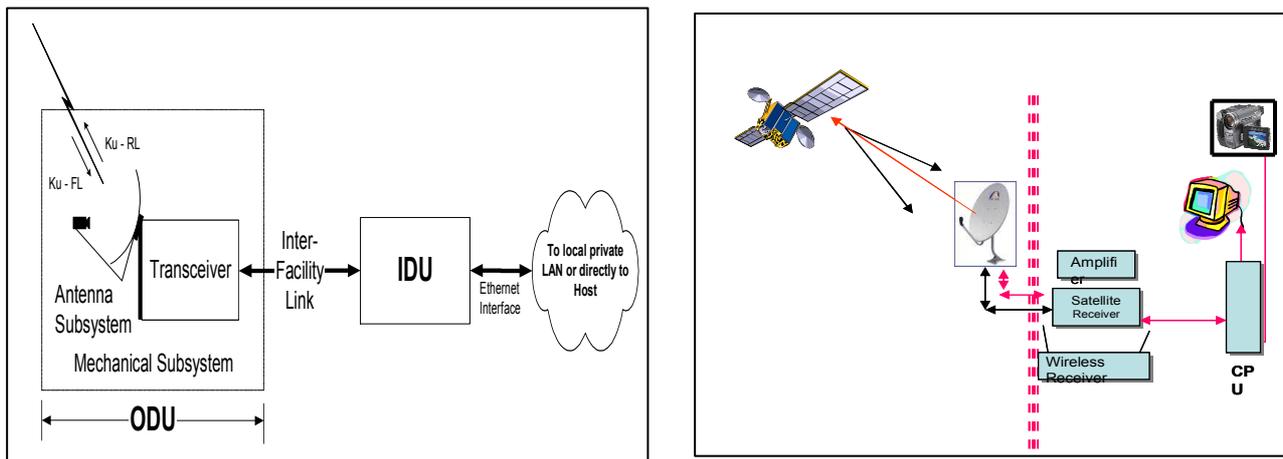


Fig- H (I): Linking and set-up of Satellite Interactive terminals

Satellite Interactive Terminals are connected with network by putting the system on, in the same way as any computer system is put on. During the initial installation and configuration of SIT a unit-ID is provided to each terminal by the hub administrator. This is known as Login-ID of that particular SIT. This unit-ID of SIT is synchronized with the web IP address of LMS server, and Student-ID is generated.

Through this student-ID, presence of SIT is seen in the presentation PC at the studio. Presence of SIT and performance of signals are observed and monitored by collecting BER data from Hub.

#### IV. DISCUSSION AND OBSERVATIONS

Table-1 presents the detail of study centre in terms of its location, type of institution, area to which it belongs, number and category of students. Figure-A shows that 47% SITs of the present network belong to rural area, 18% to tribal area and remaining 35% to urban areas. They are either government schools or colleges. They have been chosen in such a way so that they can represent whole Madhya Pradesh. Target group selected in 32 study centres for this study is mainly graduation first year students. In all eight Regional Centres, Lectures of MSW (Master of Social Work) previous classes were telecasted and in co-located SIT of Head Quarter; classes of PGDHN (Post Graduate Diploma in Health and Nutrition) were also telecasted (Table-2). Cost affectivity is main consideration of this study. ISRO provided the package (network of 40 SITs) and setup the network in minimum cost. Satellite Interactive Terminals were installed in schools and colleges with minimum or no extra arrangements of space, furniture and staff. The Table-1 shows that existing working teachers have been deployed for operation of SITs and their maintenance, after giving them training of four days.

Table-3 shows the sample of schedule of telecast of recorded video lectures and live lectures. The audio-video quality of lecture was thoroughly analysed on factors mentioned in Table-4. Total data of 177 working days of 40 SITs was collected and analysed. The BER (Bit Error Rate) data (GCU BER- OUT BOUND) and REMOTE BER-INBOUND) on each working day for each SIT was collected. As a sample the representative data for the month of October, 2007 has been presented in Table-5. The Consistency or inconsistency of data indicates following factors: a) Remote is working well; b) Network is slowly going bad; c) any equipment is damaged like LNB etc., d) BUC is going down.

On the basis of BER data and day to day interaction with terminals the problems encountered were categorized and coded (Table-6). Various problems encountered in SITs have been categorized into five categories. A- Faults in Equipments, B-Over all problem of power, C- Lack of technical knowledge, D-Administrative Problems, E- Other Problems. Two major problems of each SIT having high frequency are shown in Table-1. Power problem (08-B) and problem related with operator (12-D) were found common. It has been mentioned earlier that network was made operational with existing staff and infrastructure, reducing any extra cost. Individual skill, interest and technical knowledge were major factors responsible for overall performance and qualitative result of the project.

#### V. CONCLUSIONS

The present study concentrates only to find out and suggest those possibilities which can enhance the audio-video quality of the telecast without any major change in satellite's band width and hub, and with minimum increase in cost and expenditure. The scope of enhancement has been classified as follows-

##### (A) Scope in technology-

- (1) High quality camera can be used at the transmitting end to enhance the quality of video.

- (2) At hub and SIT end separate device as encoder and decoder can be added to improve the quality of video. A separate study can be taken up in this regard
- (3) For good quality of audio high power transmitter and receiver can be used in place of low power transmitter and receiver.

##### (B) Scope in quality improvement of source video-

As mentioned earlier power point presentation was main tool used in video lecture. After detail study of out put at receiving end and feed back from students and teachers, following parameters are proposed for better quality of telecasted video lectures, with special reference to power point presentation-

- (i) Color Back ground of power point slide was found to play an important role in visibility of fonts. Dark blue colour or slight variation of shade was found effective.
- (ii) Text color is equally important. Off-white, yellow, light blue and light green coloured text gives good contrast.
- (iii) Lay out or drawing guides of power point slides is another important factor. 4.25" left and right spacing and 3.00" top and bottom spacing from the centre was found most suitable lay out on telecast mode. Four to six lines per slide are comfortable from reading and taking notes point of view.
- (iv) English Arial font, size 48 to 46 for heading and 40 to 38 for text, similarly Hindi Kruti Dev010 font, size 54 to 52 for heading and 48 to 46 for text was easily readable at receiving end.
- (v) Line diagrams, sharp images and photos and simple animations were found effective. graphics

Further studies and work particularly on graphics and animation is required. Specification of cameras required for shooting of video lectures and development of soft wares for recording and editing of Edusat telecast mode lectures was found another specific field of research.

##### (C) Room Arrangement

It was observed that SITs with proper lay out, lighting and management had better audio-video quality than those having improper arrangement. Thus (1) Room Layout (2) Room Lighting and (3) Management of Classroom can not be ignored.

Proper room layout in Satellite Interactive Terminals is shown in Figure-J. Lighting mainly requires sufficient normal day-light and complete illumination of room with white light. Walls with light colour distemper give better results. Any sound proofing arrangement enhances the quality of audio. Noise, and unnecessary movement around SIT-room should be avoided.

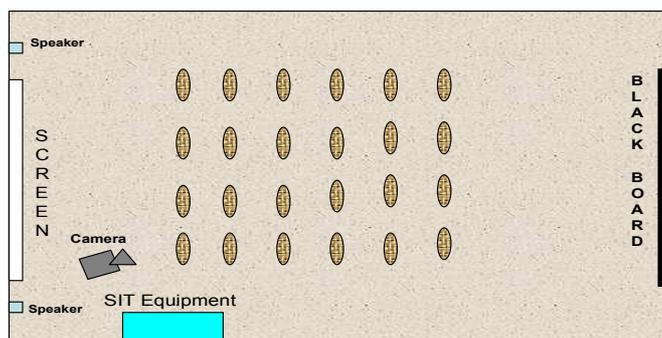


Figure-J: Proper lay-out of SIT Room

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## (C) Training of Co-ordinators

Table-1 shows that SITs are operated and maintained by existing school or college staff. Proper training, proper designing of training module may be another important area of study. Proper training controls following factors which contribute towards quality of audio and video-

- (A) Periodic checking of antenna, its direction, plastic cover on feed, proper connection of cables and ballasts are placed on the frame.
- (B) Proper watering in earth pit.
- (C) Proper placement of indoor equipment
- (D) Proper charging of UPS
- (E) Proper maintenance of mikes
- (F) Proper contact with hub engineer/administrator

## REFERENCES:

1. idsp.nic.in/idsp/UserManual/ModuleB.pdf
2. S. K. Pandey, (1999) "Handbook of Satellite communications" Authors Press, Delhi, pp135
3. D. C. Agrawal, (2004) "Digital Satellite Communication" Khanna Publication, Delhi, pp
4. V. Palsule, (2006). EDUSAT Network Configurations, Papers presented at EDUSAT Users' Meet: Southern Region January 19 & 20, 2006, jointly organized by DECU-ISRO, Ahmedabad & SAPNET, Hyderabad
5. A. Bhaskaranarayana, B. S. Bhatia, K. Bandyopadhyay and P. K. Jain (2007)- Applications of space communication, Current Science, Vol. 93, No. 12, 25 December, 2007

<b>Table-1</b>							
<b>Details of Satellite Interactive terminals</b>							
<b>SNo</b>	<b>Regional Centre</b>	<b>Study Centre</b>	<b>IP address</b>	<b>Category</b>	<b>Operators Designation</b>	<b>Problem codes as per Table-6</b>	<b>Operation Days out of 177 days</b>
1	Bhopal	Govt P G College, BHEL, Bhopal	10.254.11.1	Urban	Professor	12	113
2	Bhopal	Govt M G M P G College, Itarsi, Distt Hoshangabad	10.254.13.1	Urban	Librarian	08, 12	108
3	Bhopal	Govt H S School, Rehti, Distt Sehore	10.254.12.1	Rural	Computer Teacher	08, 10, 12	125
4	Bhopal	Govt H S School, Tyonda, Distt Vidisha	10.254.15.1	Rural	Principal	08, 10, 12	109
5	Bhopal	Govt H S School, Machalpur, Distt Rajgarh	10.254.14.1	Rural	Teacher	08, 04	88
6	Bhopal	Govt P G College, Javra, Distt Ratlam	10.254.24.1	Urban	Professor	08, 12	117
7	Bhopal	Govt P G College, Mandsaur	10.254.27.1	Urban	Professor	08, 12	116
8	Bhopal	Regional Centre, ITI Building, Govindpura, Bhopal	10.254.1.1	Urban	Regional Director	12	177
9	Gwalior	Govt H S School, Kelaras, Distt Morena	10.254.34.1	Rural	Teacher	08, 12, 06	49
10	Gwalior	Govt H S School, Khaniadhana, Distt Sivpuri	10.254.44.1	Rural	Teacher	08, 12	131
11	Gwalior	Regional Centre, Jiwaji University, Campus, Gwalior	10.254.30.1	Urban	Regional Director	08, 13	134
12	Gwalior	Govt H S School, Kumbhraj, Distt Guna	10.254.39.1	Rural	Teacher	08, 04, 11	113
13	Indore	Regional Centre, Devi Ahilya University, Campus, Indore	10.254.22.1	Urban	Professor	08,12	158
14	Indore	Govt H S School, Shahpur, Distt Burhanpur	10.254.41.1	Rural	Teacher	08, 12, 15	87
15	Indore	Govt H S School, Ghatabillod, Distt Dhar	10.254.17.1	Tribal	Principal	08	119
16	Indore	Govt H S School, Mandleshwar, Distt, Khargone	10.254.16.1	Tribal	Principal	08	119
17	Indore	Govt H S School, Maheshwar, Distt Khargone	10.254.20.1	Tribal	Principal	08	108
18	Jabalpur	Govt H S School, Shahpura, Distt Dindori	10.254.25.1	Tribal	Teacher	08, 12, 04	100
19	Jabalpur	Regional centre, Old BTI Building, PSM Campus, Jabalpur	10.254.46.1	Urban	Regional Director	08	158
20	Jabalpur	Govt H S School, Narayanganj, Distt Mandla	10.254.19.1	Tribal	Teacher	08 12, 07	63
21	Jabalpur	Govt H S School, Sijhora, Distt Mandla	10.254.18.1	Tribal	Teacher	08 12, 01	105
22	Rewa	Regional Centre, Old TRS College Campus, Rewa	10.254.47.1	Urban	Regional Director	08, 14, 04	100
23	Rewa	Nehru Smarak Mahavidyalaya, Chakghat, Distt Rewa	10.254.36.1	Urban	Professor	08, 14, 04	83
24	Rewa	Govt H S School, Kamarji, Distt Sidhi	10.254.29.1	Rural	Teacher	08, 12,14, 04	90
25	Rewa	Govt H S School, Baghwar, Distt Sidhi	10.254.28.1	Rural	Teacher	08, 12,14, 04	47
26	Rewa	Govt H S School, Manpur, Distt Umaria	10.254.33.1	Tribal	Teacher	08, 12,14, 04	67
27	Rewa	Govt H S School, Mangawan, Distt Rewa	10.254.32.1	Rural	Principal	08, 14, 04	91
28	Sagar	Govt H S School, Malthone, Distt Sagar	10.254.42.1	Rural	Teacher	08, 12, 13	61

**Table-1**  
**Details of Satellite Interactive terminals**

SNo	Regional Centre	Study Centre	IP address	Category	Operators Designation	Problem codes as per Table-6	Operation Days out of 177 days
29	Sagar	Govt H S School, Orchha, Distt Tikamgarh	10.254.43.1	Rural	Teacher	08, 12, 13	71
30	Sagar	Regional Centre, Sagar University Campus, Sagar	10.254.48.1	Urban	Regional Director	14	1
31	Satna	Govt H S School of Excellence, Rampur Baghelan, Distt Satna	10.254.38.1	Rural	Teacher	08, 12	112
32	Satna	Govt H S School, Gunaur, Distt Panna	10.254.37.1	Rural	Teacher	08, 04, 05	92
33	Satna	Govt H S School, Chandranagar, Distt Chhatarpur	10.254.35.1	Rural	Teacher	08, 04, 09	109
34	Satna	Regional centre, Old Collectorate Campus, Civil Lines, Satna	10.254.40.1	Urban	Regional Director	12, 04	158
35	Ujjain	Govt K P College, Dewas	10.254.23.1	Urban	Professor	14	0
36	Ujjain	Regional Centre, School of Continuing Education, Vikram University Campus, Ujjain	10.254.21.1	Urban	Regional Director	12	134
37	Ujjain	Govt H S School, Susner, Distt Shajapur	10.254.45.1	Rural	Teacher	08, 12, 04	51
38	Ujjain	Govt H S School, Ratangarh, Distt Neemuch	10.254.31.1	Rural	Teacher	08, 12, 10	59
39	Ujjain	Govt H S School, Piproda, Distt Ratlam	10.254.26.1	Rural	Teacher	08, 12, 10	100
40	Ujjain	Govt H S School, Rignod, Distt Ratlam	10.254.49.1	Rural	Teacher	14	0

**Table-2**  
**Satellite Interactive Terminals, Category and target group**

SN	IP	Regional Centre	Study Centre	Category	BA	BSc	BCom	MSW/PGDHN	total
1	10.254.11.1	Bhopal	Govt P G College, BHEL, Bhopal	Urban	112	30	20	0	162
2	10.254.13.1	Bhopal	Govt M G M P G College, Itarsi, Distt Hoshangabad	Urban	45	18	5	0	68
3	10.254.12.1	Bhopal	Govt H S School, Rehti, Distt Sehore	Rural	30	12	0	0	42
4	10.254.15.1	Bhopal	Govt H S School, Tyonda, Distt Vidisha	Rural	88	0	0	0	88
5	10.254.14.1	Bhopal	Govt H S School, Machalpur, Distt Rajgarh	Rural	120	41	0	0	161
6	10.254.24.1	Bhopal	Govt P G College, Javra, Distt Ratlam	Urban	63	26	17	0	106
7	10.254.27.1	Bhopal	Govt P G College, Mandsaur	Urban	39	7	0	0	46
8	10.254.1.1	Bhopal	Regional Centre, ITI Building, Govindpura, Bhopal	Urban	0	0	0	200/40	240
9	10.254.34.1	Gwalior	Govt H S School, Kelaras, Distt Morena	Rural	67	0	0	0	67
10	10.254.44.1	Gwalior	Govt H S School, Khaniadhana, Distt Sivpuri	Rural	176	0	0	0	176
11	10.254.30.1	Gwalior	Regional Centre, Jiwaji University, Campus, Gwalior	Urban	0	0	0	60	60
12	10.254.39.1	Gwalior	Govt H S School, Kumbhraj, Distt Guna	Rural	188	0	0	0	188
13	10.254.22.1	Indore	Regional Centre, Devi Ahilya University, Campus, Indore	Urban	0	0	0	55	55
14	10.254.41.1	Indore	Govt H S School, Shahpur, Distt Burhanpur	Rural	51	103	0	0	154
15	10.254.17.1	Indore	Govt H S School, Ghatabillod, Distt Dhar	Tribal	54	0	100	0	154
16	10.254.16.1	Indore	Govt H S School, Mandleshwar, Distt, Khargone	Tribal	56	0	0	0	56
17	10.254.20.1	Indore	Govt H S School, Maheshwar, Distt Khargone	Tribal	15	0	0	3	18
18	10.254.25.1	Jabalpur	Govt H S School, Shahpura, Distt Dindori	Tribal	14	10	0	0	24
19	10.254.46.1	Jabalpur	Regional centre, Old BTI Building, PSM Campus, Jabalpur	Urban	0	0	0	72	72
20	10.254.19.1	Jabalpur	Govt H S School, Narayanganj, Distt Mandla	Tribal	32	13	5	0	50
21	10.254.18.1	Jabalpur	Govt H S School, Sijhora, Distt Mandla	Tribal	18	21	0	0	39
22	10.254.47.1	Rewa	Regional Centre, Old TRS College Campus, Rewa	Urban	0	0	0	70	70
23	10.254.36.1	Rewa	Nehru Smarak Mahavidyalaya, Chakghat, Distt Rewa	Urban	34	32	4	0	70
24	10.254.29.1	Rewa	Govt H S School, Kamarji, Distt Sidhi	Rural	290	84	0	0	374
25	10.254.28.1	Rewa	Govt H S School, Baghwar, Distt Sidhi	Rural	16	17	4	0	37
26	10.254.33.1	Rewa	Govt H S School, Manpur, Distt Umariya	Tribal	170	18	0	0	188
27	10.254.32.1	Rewa	Govt H S School, Mangawan, Distt Rewa	Rural	198	225	0	0	423
28	10.254.42.1	Sagar	Govt H S School, Malthone, Distt Sagar	Rural	162	0	0	0	162
29	10.254.43.1	Sagar	Govt H S School, Orchha, Distt Tikamgarh	Rural	298	0	0	0	298
30	10.254.48.1	Sagar	Regional Centre, Sagar University Campus, Sagar	Urban	0	0	0	50	50
31	10.254.38.1	Satna	Govt H S School of Excellence, Rampur Baghelan, Distt Satna	Rural	11	2	1	0	14
32	10.254.37.1	Satna	Govt H S School, Gunaur, Distt Panna	Rural	188	116	0	0	304
33	10.254.35.1	Satna	Govt H S School, Chandranagar, Distt Chhatarpur	Rural	226	161	0	0	387

## Edusat Satellite Based Education: Study of Scope for Enhancement of Audio-Video Quality- A Case Study of Madhya Pradesh Bhoj (Open) University

Satellite Interactive Terminals, Category and target group									
SN	IP	Regional Centre	Study Centre	Category	BA	BSc	BCom	MSW/PGDHN	total
34	10.254.40.1	Satna	Regional centre, Old Collectorate Campus, Civil Lines, Satna	Urban	101	48	22	0	171
35	10.254.23.1	Ujjain	Govt K P College, Dewas	Urban	180	122	120	0	422
36	10.254.21.1	Ujjain	Regional Centre, School of Continuing Education, Vikram University Campus, Ujjain	Urban	0	0	0	40	40
37	10.254.45.1	Ujjain	Govt H S School, Susner, Distt Shajapur	Rural	40	0	0	0	40
38	10.254.31.1	Ujjain	Govt H S School, Ratangarh, Distt Neemuch	Rural	80	0	0	0	80
39	10.254.26.1	Ujjain	Govt H S School, Piploda, Distt Ratlam	Rural	34	0	0	0	34
40	10.254.49.1	Ujjain	Govt H S School, Rignod, Distt Ratlam	Rural	30	0	0	0	30

**Table-3**

Schedule of Recorded Video lectures 11.00am to 01.00pm and repetition 03.00pm to 05.00pm				
Date	Class	Subject	Topic	Presenter
03.03.2008	B.Sc-I	Physics	Laws of Motion	Dr Shirish Joshi
03.03.2008	B.A.-I	History	History of ancient India	Dr Smt Sanjana Sharma
04.03.2008	B.A.-I	History	Modern era in Europe	Dr Ranjana Sharma
04.03.2008	B.A.-I	English	Alexandar Pope's "An Essay on Criticism"	Dr Vikas Jaoolkar
05.03.2008	B.Sc-I	Chemistry	Gaseous State	Dr R. K. Shrivastava
10.03.2008	B.Sc-I	Chemistry	Isomerism- Part-1	Dr. Smt. Kumud Shrivastava
10.03.2008	B.A.-I	Sociology	Introduction of Sociology- Part-1	Dr. Smt. Deepti Shrivastava
10.03.2008	B.A.-I	History	Maurya Kala evam Staphatya Kala	Dr Sushmita Pandey
11.03.2008	B.A.-I	Hindi	Manak indi Bhasha	Dr. Mrs. Pratibha Singh
11.3.2008	B.Sc-I	Geology	Bonding in Minerals and Silicate Structure	Dr. Habibullah Usmani
12.03.2008	B.Sc-I	Zoology	Fundamentals of Biodiversity and Biotechnology	Dr. Alok Verma
12.03.2008	B.Sc-I	Chemistry	Atomic Structure	Smt. Rashmi Shrivastava
13.03.2008	B.A.-I	Psychology and Management	Work Stress Management & Stress management	Dr A L Ram
13.03.2008	B.Sc-I	Zoology	Cell Biology	Dr. Mrs. Suchitra Banerjee
17.03.2008	B.Sc-I	Physics	Elasticity	Dr Sadhna Singh
17.03.2008	B.Sc-I	Physics	Simple Harmonic Motion and Lisaazu's Figure	Shri Amit Jain
18.03.2008	B.H.Sc-I	Home Science	Macro Nutrients	Dr. Smt. Manjula Vishwas
18.03.2008	B.Com-I	Commerce	Matrix	Dr. Rajeev Choubey
19.03.2008	B.Sc-I	Geology	Weathering and Erosion	Dr Rakesh Shrivastava
19.03.2008	All Classes	General Lecture	Organizational & Interpersonal Conflicts	Dr Dinesh Nagar

**Table-4**

### Analysis of content and presentation to be telecasted through Edusat

Broad Category	Details
About lecture	Class, year, paper, unit, topic Selection of topic Content of lecture Script of lecture Objectives of lecture Summary, conclusion and questions
Power Point Presentation	Number of slides Background colour Lay out of slide Colour of fonts Size of fonts Sharpness and contrast of the images used Effectivity of line diagrams
Other Audio-visual aids	Models, charts, presentation, video clippings- assessment in terms of their audio-video quality.

**Table-5**  
**Representative Sample of BER data collected from hub and associated with problem**

Reg_Centre	Study Centre	status	BER_remote	BER_GCU	Remark
Bhopal	Govt P G College, BHEL, Bhopal	UP	0.00259	2.04 e-02	
Bhopal	Govt M G M P G College, Itarsi, Distt Hoshangabad	DOWN	N/A	N/A	LOW C/N
Bhopal	Govt H S School, Rehti, Distt Sehore	UP	0.00032	8.23 e-03	
Bhopal	Govt H S School, Tyonda, Distt Vidisha	DOWN	N/A	N/A	RCST is put off manually
Bhopal	Govt H S School, Machalpur, Distt Rajgarh	DOWN	N/A	N/A	RCST UPS LNB ORU FAULTY Fault in RCST, LNB
Bhopal	Govt P G College, Javra, Distt Ratlam	UP	0.00608	2.20 e-02	
Bhopal	Govt P G College, Mandsaur	UP	0.00252	1.66 e-02	
Bhopal	Regional Centre, ITI Building, Govindpura, Bhopal	UP	0.00451	5.49 e-03	
Gwalior	Govt H S School, Kelaras, Distt Morena	DOWN	N/A	N/A	SAT not stable
Gwalior	Govt H S School, Khaniadhana, Distt Sivpuri	UP	0.00057	1.81 e-02	
Gwalior	Regional Centre, Jiwaji University, Campus, Gwalior	DOWN	N/A	N/A	Problem in LAN card
Gwalior	Govt H S School, Kumbhraj, Distt Guna	DOWN	N/A	N/A	SAT not stable
Indore	Regional Centre, Devi Ahilya University, Campus, Indore	DOWN	N/A	N/A	RCST is put off manually
Indore	Govt H S School, Shahpur, Distt Burhanpur	DOWN	N/A	N/A	RCST is put off manually
Indore	Govt H S School, Ghatabillod, Distt Dhar	UP	0.00077	4.42 e-03	
Indore	Govt H S School, Mandleshwar, Distt, Khargone	UP	0.00231	9.83 e-03	
Indore	Govt H S School, Maheshwar, Distt Khargone	UP	0.01178	8.26 e-03	
Jabalpur	Govt H S School, Shahpura, Distt Dindori	UP	0.00435	2.06 e-02	
Jabalpur	Regional centre, Old BTI Building, PSM Campus, Jabalpur	UP	0.00376	3.25 e-03	
Jabalpur	Govt H S School, Narayanganj, Distt Mandla	UP	0.00118	1.87 e-03	Fault in CPU
Jabalpur	Govt H S School, Sijhora, Distt Mandla	DOWN	N/A	N/A	Fault in UPS
Rewa	Regional Centre, Old TRS College Campus, Rewa	UP	0.00836	3.22 e-02	
Rewa	Nehru Smarak Mahavidyalaya, Chakghat, Distt Rewa	UP	0.00911	4.82 e-02	
Rewa	Govt H S School, Kamarji, Distt Sidhi	DOWN	N/A	N/A	Power Problem
Rewa	Govt H S School, Baghwar, Distt Sidhi	DOWN	N/A	N/A	Power Problem
Rewa	Govt H S School, Manpur, Distt Umaria	DOWN	N/A	N/A	Fault in UPS
Rewa	Govt H S School, Mangawan, Distt Rewa	UP	0.000155	2.69 e-03	
Sagar	Govt H S School, Malthone, Distt Sagar	DOWN	N/A	N/A	RCST is put off manually
Sagar	Govt H S School, Orchha, Distt Tikamgarh	DOWN	N/A	N/A	Fault in UPS
Sagar	Regional Centre, Sagar University Campus, Sagar	N/A	N/A	N/A	Room not available
Satna	Govt H S School of Excellence, Rampur Baghelan, Distt Satna	UP	0.00234	1.21 e-02	
Satna	Govt H S School, Gunaur, Distt Panna	UP	0.00264	1.16 e-02	Fault in camera
Satna	Govt H S School, Chandranagar, Distt Chhatarpur	UP	0.00153	6.94 e-03	
Satna	Regional centre, Old Collectorate Campus, Civil Lines, Satna	UP	0.03167	7.06 e-03	
Ujjain	Govt K P College, Dewas	DOWN	N/A	N/A	Room shifting
Ujjain	Regional Centre, School of Continuing Education, Vikram University Campus, Ujjain	UP	0.00437	1.53 e-02	
Ujjain	Govt H S School, Susner, Distt Shajapur	UP	0.00559	1.66 e-02	
Ujjain	Govt H S School, Ratangarh, Distt Neemuch	DOWN	n/A	N/A	SAT not stable
Ujjain	Govt H S School, Piploda, Distt Ratlam	UP	0.00156	8.39 e-03	
Ujjain	Govt H S School, Rignod, Distt Ratlam	N/A	N/A	N/A	Antenna Problem

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**Table-6**  
**Code, category and nature of problems encountered in SITs**

Code and Category	Nature of the problem
01-A	Low C/N (Carrier to Noise ratio)
02-A	Fault in UPS, Low input
03-A	Fault in CPU
04-D	Room shifting, improper maintenance and lay out of SIT room
05-A	Problem in LAN card
06-E	Shifting or de-alignment of antenna due to animal like monkey
07-A	SAT (Satellite Access Terminal) not stable
08-B	Power problem
09-A	Fault in RCST, LNB
10-C	Problem in cable connection
11-C	RCST is put off manually
12-D	Operator not available, or engaged in some other assignment
13-A	Fault in Camera
14-D	Non-availability of space as per prescribed lay-out of SIT
15-C	Improper logging