Digital Life Certificate – A Journey from Manual to Digital India

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Abstract: Internet and Web are leading to significant changes in education delivery models. A traditional classroom has shifted to an E- Learning model of classroom. Virtual Classroom is a simulated classroom environment via Internet/Dedicated high speed Network, which provides a convenient communication environment for distance learners simulating the traditional face- to- face classroom. A virtual classroom facilitates in bringing together distance learners around the globe to join together in highly interactive environment. It helps in reducing the travel time, expenses hiring specialist teachers on-site and improves sharing of resources across distributed campuses. Virtual Classroom are built using videoconferencing as base equipment. It is used for distance teaching as well as for distance learning. NIC has been taken initiative to establish virtual classroom wherein all instructions of repute in India HAVE BEEN CONNECTED OVER National Knowledge Network (NKN). This paper discusses the basic aspects of virtual classroom and advantage being gained in spreading excellence education in India.

Keywords: E-learning, Virtual Classroom, Video Conferencing, Distance Teaching, Distance Learning, NKN

I. INTRODUCTION

With the ever-increasing popularity and accessibility of the Internet, it is natural that the educational community makes use of this technology for dissemination of Knowledge. Usage of the Internet and web are leading to significant changes in education delivery models. Effective adequate attention to understanding the technology, the educational processes and issues, student's characteristics pedagogy etc [1,2].

Use of Internet is on the increase among the faculty and student community. A traditional classroom has shifted to an E-Learning model of classroom. While advancements in communication tools have been easily adapted to learning methods, it was the introduction of the personal computer and the spread of the Internet that has brought the most radical transformation in higher education. Learning by computer can be as easy as communicating with your mentor / professor / teacher and fellow classmates via email, student utilizing an interactive CD-ROM.

Thus, E-Learning can be defined an approach to facilitate and enhance learning by means of personal computers, portable media and the Internet. It may be as simple as those teachers may simply post their material on Internet; student can be read it online or can download it for further access. Since student won't be in a classroom with professor and classmates, he is required to be capable of independent learning [15]. A teacher will provides a student syllabus, course documents, and required readings. The interaction between the teacher and the student happens via e-mail, discussion board, forums, blogs etc. Since the class doesn't meet in a physical space at a scheduled time, the student has to learn independently. He is responsible for keeping up with the assigned reading and completing

assignments according to the timeline on the syllabus.

The growing popularity of E-Learning demands not only availability of online study materials but also online interaction with teachers while teacher is delivering lectures. It has introduced a new term to educational infrastructure called – Virtual Classroom[14]. In a virtual classroom student are preset with his professor and fellow learners in a classroom. They are not present physically in the same classroom but connected to the classroom via Internet. Virtual classroom aims to simulate the experience of attending a class over the Internet. So everyone is able to view other participant virtually and interact with teacher in real time.

Just as the term Virtual means a simulation of the real thing, Virtual Classroom is a simulated classroom environment via Internet/ Dedicated high speed Network, which provides a convenient communication environment for distance leaners just like traditional face-to-face classroom. A virtual classroom allows learners to attend a class from anywhere and aims to provide a learning experience that is similar to a traditional real classroom. It facilitates teacher and student in teaching –learning scenarios, such as taking academic courses, seminar, interviews, discussion, or a live training [7].

When we go to college we have a schedule / time table of lectures, which one has to attend. Students must arrive on time, and when he enters the classroom, he finds a teacher, fellow learners, a blackboard or whiteboard, LCD projector and a LCD screen. Likewise, a Virtual Classroom is an online scheduled, teacher-led session where teachers and learners interact with each other using Virtual Classroom (VC) setup run over a network, as shown in the Figure 3, with the only difference being that the student and the teacher are physically present at different locations.

A virtual classroom enables to bring learners from around the world together online in highly interactive virtual classroom. It helps in reducing travel time & cost, expenses on hiring specialized teachers on-site and improves sharing of resources across distributed campuses [11, 12].

As in traditional classroom, there are teacher / professor are present with the student; similarly there would be many local & remote participants who will be present in virtual classroom. They can interact and view each other as in the traditional classroom via the virtual classroom setup. Teacher / Presenter can not only see talk to student / participants but also can share presentation, show models similar to that in traditional Classroom. Teacher can also use annotation tablets as teaching aids to elaborate on a particular topic using notes / resources etc. Student on the other side can see the teacher on a LCD screen and see the presentation on a separate Projector screen simultaneously. Student can ask questions to the teacher in real-time and clear their doubts if any as in the traditional classroom [3].

The paper is organized in six sections. Section 2 deals with equipments and technology involved in establishing a virtual classroom in Indian context. Operational scenario of virtual classroom is discussed in the Section 3. Section 4 and 5 mention about the advantages And limitation of a virtual classroom. The paper is finally concluded in the Section 6.

II. EQUIPMENTS REQUIRED

Virtual classrooms are built using videoconferencing equipments as base components along with other

equipments like display unit, audio system etc over a high speed network. While establishing virtual classroom across India, as shown in the Table 1, we opted for two types of virtual classrooms: PC based virtual classroom and Hardware codec based virtual classroom.

Table 1: Availability of Virtual Classroom in India

(Please refer the table on page No)

The selection of the type for the Virtual Classroom depends on the availability network bandwidth, number of students / learners, type of environment, type of institution and of course availability of funds for procuring the required equipments. We have restricted our discussion in this paper to the technical aspect only and therefore financial part is not discussed here.

III. PC BASED VIRTUAL CLASSROOM

While setting up a virtual classroom, the two important factors needs to be considered are interactivity among remote learners and teachers. This type of virtual classroom is suitable for a group of 40 – 50 students. This small group of learners in a virtual classroom can be better managed with respect to interactivity & visibility. A minimum of 512 kbps assured bandwidth is required to run this type virtual classroom and it can operate on any type of public network including broadband. Such virtual classroom can be setup with minimum up gradation of existing civil & electrical structures, like blocking of natural sun light entering the classroom, proper interior lighting, UPS electrical points etc. It is very cost effective and thereby it can be replicated at multiple locations [5].

A PC based videoconferencing setup is a low latency high definition quality class over the Internet. It is live in nature, although it can be recorded and beamed as unicast / multicast over the network. The equipments required to set up this type of classroom are:

- Desktop PC with One slim Monitor & dual display output card
- One USB Web Camera for capturing the students view
- One USB Web Camera and fixed USB table microphone for the teacher
- One LED Display Unit (Typically 40inch or above)
- Projector (Typically 100 inch motorized screen)
- Cordless Microphone with base unit
- UPS (Typically 1 KVA) and necessary cables, wires and accessories.

While setting up this virtual classroom, conventional hardware based videoconferencing system is used as base equipment and following equipments are additionally required.

- Hardware based High Definition videoconferencing system
- Three High Definition LCD Display units (Typically 55 inch),
- Projector (Typically 120 inch screen),
- Two PTZ (Pan Tilt Zoom) HD Camera
- Annotation pane, Document Camera
- DSP based Audio system with amplifier, speaker, audio mixer etc
- Ceiling microphones, cordless microphone etc.
- Control system with touch panels
- UPS (Typically 5 KVA), Rack and required wires, cables and accessories.

This type of virtual classroom setup is typically suitable for 80-100 students. It requires minimum of 4 mbps assured and dedicated bandwidth to make this type virtual classroom function smoothly. It cannot be operated on public internet network or

broadband. It requires a dedicated Qos implemented closed user group community network like National Knowledge Network (NKN) [9].

IV. OPERATIONAL SCENARIOS

Number of virtual classrooms, as shown in the Table 1, has been setup in such a way that it can be used for both Distance Teaching and Distance Learning. Distance Teaching is the mode wherein a teacher is present in the classroom and delivers lecture to remote students. The teacher will see the student view on LCD screens and the projector screen will be used to display the presentation or annotation which teacher is sharing with students. The teacher can view and interact with the remote students as naturally as in traditional classroom. It is also possible that some local students can also be present in the classroom where the teacher is present [6].

In Distance Learning mode. Students are present in the classroom and they see the remote teacher on the LCD screen and presentation shared by the remote teacher on the projector screen. These two views come simultaneously on both the display units which make the classroom environment more close to traditional classroom [5].

A virtual classroom system setup requires central equipments like severs, Multipoint Control Units (MUU), Gateways, Portal and other related software to supports the Virtual Classrooms / VC endpoints which are located at geographically different locations. The setup uses heterogeneous network that run at different speeds and possibly under different administrative domain. These Central equipments require dedicated high Bandwidth and preferably located at core network. Multipoint Conference Unit helps in connecting multiple classrooms together in a single classroom session. The number of classrooms which can join together depends on the capacity and licenses of MCU. A gateway helps to connect any stand- alone virtual classrooms / VC endpoints with software based virtual classrooms /VC endpoints.

The scope and usage of virtual classroom is further extended outside classroom using recording and webcasting technology. The Recording and webcasting appliance will enable large number of user to join classroom lecture concurrently via web browser, either in real time or at any time later. Recording and webcasting can be initiated by any endpoint, including hand held devices, laptop and desktop. This infrastructure extends education beyond classroom walls to reach students, faculty, staff and alumni wherever they are.

It enables campus-wide collaboration networks. Students, faculty and staff collaborate using everyday PC and Mac desktop and tablet devices to create the best learning environment. A typical operation scenario is shown in the Figure 3.

V. ADVANTAGES

A virtual classroom allows learners and teachers to attend a single live session from any location. A lecturer delivers his lecture not only from any of the virtual classroom but also from anywhere in the world. Similarly a student can also attend any virtual classroom session from anywhere, provided the student's desktop is equipped with a web camera, microphone with speakers. In this way it helps in removing geographical barriers and thereby implementing 'Anywhere learning' [6, 10].

A Class / session / event can be organized more quickly than traditional classroom. Classrooms and Audio Visual equipments do not need to be reserved; materials do not need to be distributed. The sessions are easier to schedule or reschedule

since attendees will not be travelling to the venue of the session. Classrooms which are geographically distributed joins together into a single classroom and all can listen / attend any specialist lecture / course / session in a single go. This is facilitated by using the Multipoint Conference Unit (MCU).

A virtual classroom has a facility to record and archive the session so that learners or teachers review the same as and when required. Students who are not part of the regular course also get the opportunity to learn from the recorded content so as to enrich their domain knowledge from anywhere. Teachers also get an opportunity to review their own session for further improvements. It is also possible to unicast or multicast live lecture over the internet / dedicated network to increase the participants to virtually unlimited number of participants. Any participants can listen to live lecture from comfort of their own desk. Though it gives lots of advantages, virtual classroom has some limitations as well as outlined in the following section.

VI. LIMITATIONS

Teachers and students are familiar with the working of a traditional classroom, i.e., they understand the concepts of raising hand to ask a question, the black / whiteboard, assignment, and so forth. While in a virtual classroom, the teacher and students might need to familiarise themselves with the way the virtual classroom works and the etiquette to be followed.

Attending virtual classroom sessions is restricted to a certain time schedules. This needs to be pre co-ordinated and organized in a scheduled fashion so that the participants can be informed in advanced. The challenge is to make a global time table for the courses / sessions which can be followed by the students similar to the traditional classroom and a system in place to provide academic credits for the courses they attend. There must be minimum infrastructure like network connection and a virtual classroom setup equipped with teaching and learning tools are required [13].

Technical issues such as latency of network, congestion in the network may create problem like video freezing or audio problem which can disturb the flow of lecture. Similarly local power failure & local network failure may also create problem and to disturbance in the continuity of the session. Another limitation is Management and technical assistance. Though no special qualification is required to run and manage virtual classroom but one person with basic computer knowledge is require to prepare the room with respect to switching on the PC, logging in to portal, checking audio- video & establishing the connection before the class begins at pre-defined time. The technical assistant can also help to focus / point the camera to the student who is asking question during the live class or help in movement of cordless microphone among the students.

VII. CONCLUSION

The primary purpose of the Virtual Classrooms is allow instructors to teach their students in the simulated environment of a classroom virtually that they would normally get in a traditional classroom of sitting strength of 40-50 students. A virtual classroom creates an environment very similar to traditional classroom where teacher and student can interact in real-time and virtual space wherein one can see and talk to each other in reality. Students can raise their queries, ask questions and interact with teacher. A virtual classroom is equipped with facilities that can be used for both distance teaching as well as distance learning.

In distance teaching mode a teacher is present in the classroom and delivers lecture to the local students / students connected through virtual classroom setup. However in the distance learning mode only students are present in the virtual classroom and the teacher is at any remote location. Good quality cameras, audio systems & display devices help in simulating a real classroom scenario though virtual classroom setup. More than one virtual classroom can be connected remotely into a single lecture session using the MCU (Multipoint Control Unit) at central location. Classroom sessions can be simultaneously recorded as well as beamed as unicast / multicast over the network.

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Table 1: Availability of Virtual Classroom in India

Sl No.	State	Institute	City	VC Rooms	Class Room Size
1.	Andhra Pradesh	IIT	Hyderabad	3	65
		NIT	Warangal	1	70
		NIC	Hyderabad	1	60
2.	Assam	IIT	Guwahati	1	65
		NIT	Cachar (Silchar)	1	60
		NIC	Guwahati	1	60
3.	Bihar	IIT	Patna	3	72
		NIT	Patna	1	65
4.	Chhattisgarh	NIT	Raipur	1	67
5.	Delhi	IIT	New Delhi	3	75
		NIC	New Delhi	1	70
6.	Gujarat	IIT	Gandhinagar	3	74
7.	Haryana	NIT	Kurukshetra	1	65
8.	Himachal Pradesh	IIT	Mandi	1	60
		IISER, IISc.	Bangalore	3	75
9.	Karnataka	NIT	Surathkal	1	74
		TIFR	Bangalore	3	75
10.	Kerala	IISER	Trivandrum	1	70
		IISER	Bhopal	1	74
11.	Madhya Pradesh	IIT	Indore	1	72
		MANT	Bhopal	1	70
		IISER	Pune	1	75
12.	Maharashtra	IIT	Mumbai	3	75
		VNIT	Nagpur	1	74
		NIC	Pune	1	70
13.	Odisha	NIT	Bhubaneswar	4	75
		NIC	Bhubaneswar	1	70
14.	Punjab	IISER	Mohali	1	65
		IIT	Ropar	1	69
		NIT	Jalandhar	1	72

15.	Rajasthan	IIT	Jodhpur	3	76
		MNIT	Jaipur	1	74
16.	Tamil Nadu	CMI	Chennai	1	66
		IIT	Chennai, Madras	3	65
		NIT	Tiruchpali, Trichy	1	70
17.	Tripura	NIT	Agartala	1	66
18.	Uttar Pradesh	IIT	Kanpur	3	72
		MNNIT	Allahabad	1	68
19.	Uttarakhand	IIT	Haridwar, Roorkee	3	65
20.	West Bengal	IISER	Kolkata	1	73
		IIT	Kharagpur	3	76

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He is playing as one of the leading role for implementing the vision of Prime Minister of India for making the life of Senior citizens with the use of biometric technology and Aadhaar.