VIRTUAL CLASSROOM: ARCHITECTURE AND ITS FUTURE IN EDUCATIONAL INSTITUTIONS

By

PARTHASARATHY. M * R. ANANTHASAYANAM ** R. RAVI ***

* Lecturer, Dept. of Educational Technology, Bharathiar University, Coimbatore.
** Professor and Head, Dept. of Educational Technology, Bharathiar University,Coimbatore .
*** Assistant Professor, School of Education, Karunya University, Coimbatore.

ABSTRACT

The educational system around the world is undergoing a tremendous change in the area of knowledge and strategy. In general, the curriculum practices have revolutionized by the academicians and educational administrators. The learners have also demanded varied types of knowledge and skills required for their day-to-day activity. Nature and the forms of educational system should accommodate the requirement of the nation and society in general individual learner in particular. The traditional classroom approaches requires a tremendous change in the way of delivery and knowledge transmission for the development of cognitive and non-cognitive areas of learning with emphasize on qualities of personal and social growth. The education commissions and committees have also recommended and stressed that education should be made both universally available and more relevant. In this context this paper suggests a learner-centered approach for the demands of the nation and the society at large. The learner-centered approach suggested by this paper, a Virtual Classroom (VC) approach is a stress on its architecture, facilities, interactivity and network. Based on the criteria the authors have developed three models of VC approach and future benefits of these approaches for knowledge management system for effective acquisition, sharing, utilization and creation of knowledge in the area of teaching-learning process.

Keywords: Learner-Centered Approach, Virtual Classroom Architecture, Participation of Learners, Interaction, Virtual Classroom Network.

INTRODUCTION

Educational system of any nation is a mirror which reflects the image of the nation being shaped. The beginning of this century has seen revolutionary changes in the field of education. Education has been undergoing a revolution from teacher-centered to learner-centered system and this demands changes in the instructional process and materials for making the process more effective. Learning occurs through the interaction between the teacher and learner mediated by the curricular practices. The nature and form of such interaction varies with the type and level of curricular practices. Curriculum attempts at the development of cognitive and non-cognitive areas of learning with emphasis on key qualities of personal and social growth. Curriculum leads to an education that would reduce inequalities and respond to social cultural and economic context of the learners, the society and promote excellence. Otherwise it should lead to relevance, equity and excellence. There is a strong connection between curricular activities mediated by cultural tools and the learners' intellectual activities. Delor perceives that curriculum should reflect the four pillars of the learning i.e. learning to know, learning to do, learning to be and learning to live together. The teachers' role becomes more complex, difficult and pivotal in the context of the new curriculum. They have to get prepared for this new responsibility by creating new insight, outlook and competencies. Traditionally, learning has been thought to be a mimic activity, a process that involves students repeating or miming newly presented information (Jackson 1986).

In 1990, the World Declaration on Education for All noted that the generally poor quality of education needed to be improved and recommended that education can be

made both universally available and more relevant. The declaration also identified quality as a prerequisite for achieving the fundamental goal of equity. While the notion of quality was not fully developed, it was recognized that expanding access alone would be insufficient for education to contribute fully to the development of the individual and society. Emphasis was accordingly placed on assuring an increase in children's cognitive development by improving the quality of their education.

A decade later the Dakar framework for Action declared that access to quality education was the right of every child. It affirmed that quality was 'at the heart of education' - a fundamental determinant of enrolment, retention and achievements. Its expended definition of quality set out the desirable characteristics of learners (healthy, motivated students), processes (competent teachers using active pedagogies), content (relevant curricula) and systems (good governance and equitable resource allocation). Although this established an agenda for achieving good education quality, it did not describe any relative weighting to the various dimensions identified.

Learner-centered Approach

The new curriculum opens new avenues for learning as well as challenges for the teacher trying to implement it. In a learner-centered situation, the teacher becomes one of the many resources a student may learn from, not the primary source of information. Perhaps the best quality for constructivist teacher to have is the instantaneous and intuitive vision of the pupil's mind as it gropes and fumbles to grasp a new idea (Brooks & Brooks, 1993). Teacher acts as a facilitator, co-learner, democratic leader, and as a diagnostician. As far as instruction is concerned, the teacher should encourage the students to attain or discover the concepts and also principles that are linkages of concepts, by themselves.

In this knowledge era, the educational institutions are concentrating on knowledge systems i.e., the acquisition, sharing, utilization and creation of knowledge. This is entirely different from the past generation because of the ever increasing knowledge, courses, disciplines, learners and other demands of the learners. Now, the educational institutions are pushed to employ some effective and innovative teaching-learning approaches to meet their goals by incorporating relevant technological features.

Repeatedly teaching the basics of a subject or discussing about the fundamental knowledge and ideas of a topic is the usual practice in the day-to-day classroom. Whenever a new set of learners enter the classroom, the process of imparting fundamental cognitive skills are repeated; sometime, the repetition is done by a single teacher on same day within the school/college that has two/more batches of students (or) two/more courses that has same topic. Hence, generally the teachers are forced to not to go beyond imparting the fundamental cognitive skills. Further, the financial burden, less number of students studying a course in an institution and non-availability of experts are keeping the advanced laboratories and modern facilities away from certain institutions, this demands the technology based teaching-learning a convenient solution to avoid repetitions, impart higher order cognitive skills and demonstrate experiments without real laboratories.

Constructivist teaching practices, on the other hand, helps learners to internalize and reshape or transform new information. Teachers have to play a catalytic role, entirely different from what he or she is used to, at the moment. A teacher will have to plan learning opportunities more meaningfully and imaginatively, in which students are encouraged to learn individually, in small groups, from one another and from society and the environment at large. Preparing different ways of representing content is perhaps the most difficult part in planning the task, faced by a teacher. Teachers should create an environment that requires the students' ideas initially. Participation of students to construct knowledge is to be maximized. Students are to be encouraged to discuss and debate, the pros and cons of the different explanations, hypotheses and points of view. One way communication has to be replaced by two or multiple way communication.

Virtual Classroom as a Learner-centered Approach

The Virtual Classroom (VC) is an innovative and unique learning environment that imitates the physical classroom but exists completely independent of physical classrooms and the teaching-learning process and evaluation is achieved through networked computers and information systems. Integrating two/more classrooms by communication technology and making available of lecture video with help of information technology will replace the knowledge level repetitions. Transmitting the Lecture of an expert from one location to various locations at same time, and maintaining the lecture video repository that has edited lectures & discussions, will avoid repetition of the same lecture many times, and help to have more discussions in future to share ideas among teachers and learners, than to repeat the fundamentals. The operation of VC depends on three factors - its architecture, facilities for students' interaction and network used to connect locations.

Architecture of VC

There are three types of VC. In these three types, the Teacher-End (TE) is the central location that sends live lecture / discussion video to the Student(s)-End (SE) located in various places. The TE may function with or without a group of students, the TE with students simulate real classroom to the Ses.

i. Virtual Classroom of Groups (VC-1)

The students situated in various SEs exist in a group and SEs are the places such as learning/extension centers, school/college classroom, auditorium, and seminar hall. In this structure, the video received from TE is projected on a screen in a room, and all students listen to that as they see the teacher in real classroom. The students in the groups are allowed to raise doubts and clarified as in the real classroom, but one student from one group at a time. Participation in this architecture creates a feeling among the students that they attend classes/seminars in physical environment, as they are in a group; this is the major advantage of this VC structure (Figure 1).

ii. Virtual Classroom of Individuals (VC-2)

The individuals from various locations listen to the lectures/discussions and also participate in discussions. This architecture (Figure 2) allows the individual students to participate from wherever they are (house, office, individual PC in school/college). Here the participant's privacy is protected and they are not dependent on others (organizers, other students, etc.) to attend the classes. This environment offer more freedom to the students such as to receive the lecture or to disconnect at anytime, without distracting the teacher and other students.

iii. Virtual Classroom of both Groups and Individuals (VC-3)

This is an amalgamation of VC-1 and VC-2 architecture (Figure 3) that allows the participation of groups as well as the individual student; to merge the advantages of the first two types.

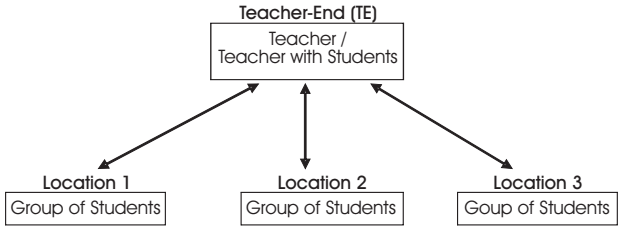

Figure 1. Virtual Classroom of Groups (VC-1)

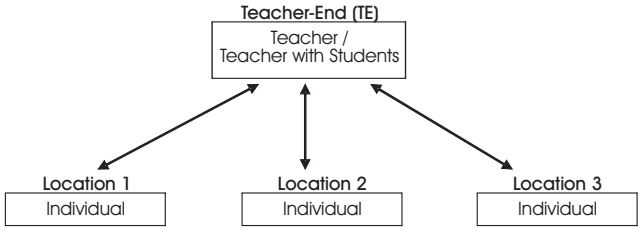

Figure 2. Virtual Classroom of Individuals (VC-2)

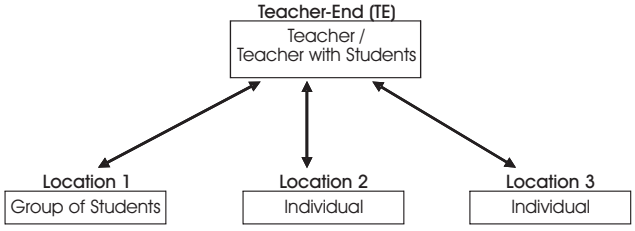

Figure 3. Virtual Classroom of Individuals and Groups (VC-3)

Participation of Students

The video that contains lecture of a teacher and discussion between the teacher and students is transmitted from TE continuously to all the SEs throughout the lecture session. The participation of students in any of the three VC architectures is of two kinds i.e., listening/viewing and interaction.

Listening

The students attending the class/seminar listen or view the lecture and discussion in the form of video. This is simply a one-way communication, and a SE should always be connected to the TE to receive the video continuously.

Interaction

The students listening to the video are allowed to ask questions, raise doubts and also interfere during the discussions. These interactions during the session shall be of text-based or audio-based or video-based. The interaction between the TE and SE reaches the other SEs also. The questions sent as a text, is read loudly by the teacher before answering (or) displayed on the video screen while teacher answers the question. The question asked in audio/video form is audible / visible respectively at other SEs simultaneously.

The VC architectures facilitates the interaction between the TE and SE by two modes i.e., permanent connection and temporary connection (Figure 4).

Permanent Connection

The entire SEs is permanently connected to the teacher-end from beginning to end of the class for the interaction. This allows the students to raise their voices at anytime, as that happens in real classroom. Even a small noise from one end will be transmitted to all the other connected ends including TE, and so many SEs linked with this connection will create a chaos situation while students raise questions. Hence, the interaction through permanent connection is much suitable for VC-1 architecture not for VC-2 architecture, as the learners connect from home/office that has external noises will disturb TE and other Ses.

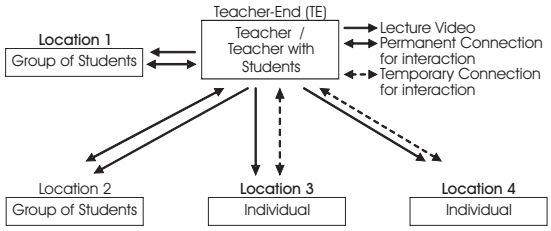

Figure 4. Participation of Students: Shows Permanent and Temporary Connections

Temporary Connection

With this facility, the SEs are connected temporarily during the interaction and disconnected immediately, and this disconnection doesn't stop receiving lecture or the discussion between the TE and other SEs. A VC environment shall support two or more number of SEs to connect with TE for interaction, but one SE connection at a time is suggestible. The temporary connection is best suited for VC-2 architecture, as the individuals connect from noisy environments such as home, office and during the travel, can disconnect immediately after the interaction. Also the individuals can depart from the lecture at anytime. So, being a temporary participant for interaction doesn't disturb other Ses.

Though many VC environment provide facility for the interaction between TE and SE, some VC designs also allow peers interactions i.e., SE to SE interaction (private arguments that disturb other participants if transmitted to all SEs), especially in VC-2 architecture. Again, the transparency of the peers' interaction also depends completely on the support provided in the VC environment.

VC Network

The transmission of live lecture video from TE and the exchange of information during the interaction require a network. The VC network is created by connecting TE and SEs. The connections between the locations are done by two popular channels viz., Virtual Private Network (VPN) and Public Network (Internet).

Virtual Private Network (VPN)

VPN is the network made between various locations privately. In a VPN, the TE and SEs are connected exclusively for conducting classes, and this is done by laying cables between the ends or using wireless

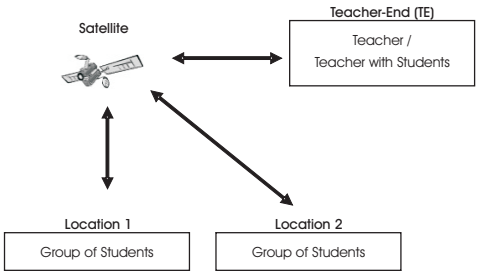

Figure 5. VC-1 Architecture with Satellite based VPN

technologies such as microwave tower and satellite (Figure 5). Many telecommunication service providers (e.g. BSNL) support establishing VPN by dedicated cables, and a number of private service providers (e.g. Tulip IT Services Ltd.) are available to provide wireless connections in cities by erecting microwave towers. Both these connections are cheap with certain limitations while comparing to the satellite connection (e.g., EDUSAT, the satellite launched by Govt. of India exclusively for satisfying the educational needs in India and now is used by many educational institutions all over India to conduct Virtual classroom).

Advantages

- The VPN based VC provides extreme security as the lecture video or interactions cannot be received by those are not connected to the network.
- Faster, due to dedicated connections between the ends.
- Peers interaction is easily possible.
- The bandwidth is same always even if the number of locations increases.
- No disconnection unless if any serious, and that too occur rarely.
- The TE is equally treated with SE in terms of bandwidth.

Limitations

- VPN is more suitable to VC-1 architecture than VC-2, since the individuals cannot bear the expenses to setup this kind of environment. However, the lecture video can also be diverted to individual PCs through a Local Area Network (LAN) if available inside the campus, and that will enable VC-2, but within the campus.
- Not an anywhere solution, because the participants should move to the location where this facility is available.

Public Network

The use of public network (internet) also provides the facility to conduct VC, and this network connection is provided by all telecommunication service providers and would be available anywhere in the world.

Advantages

- The internet is available in all parts of the world, so the students/teachers shall be located at anywhere.
- Suitable to VC-2 architecture and easy for individuals to participate from home, office, and also during travel.
- The students can get connected with cheap cost.
- This network offer complete freedom to the students, like joining and disconnecting at anytime during the session without affecting others.

Limitations

- In public networks, the bandwidth is shared by all the users connected to that network, so more number of participants would affect the quality of video transmitted from TE.
- Not suitable for VC-1, as the video quality would not be good to maximize for a group of viewers, so it is suitable for an individual student to sit close to the computer monitor and listen.
- Require more bandwidth at TE, and it's expensive at TE.

Short-term Benefits of Virtual Classroom

- Experienced and expert teachers reach wide area at the same time; the students need not travel a long distance to listen the expert lectures.
- Eliminates the repetition of knowledge by the experts at various places by transmitting the lecture from one location to various locations at same time and maintaining the lecture video repository that has edited lectures & discussions.
- Doubts are clarified immediately and the clarification also reaches the students at other locations who had

not thought about that doubt (or) not had an idea in that perspective. But, this doesn't happen in offline technology like distributing the edited lecture videos.

- Though large number of students participate, spliting up of large number into small groups in various location make them feel as they are in small physical classroom.
- The VC-2 architecture allows participating from anywhere with maximum freedom.
- Facilitate to achieve globalized education by reaching the same quality of knowledge everywhere, but in the existing setup the students get different interpretations / explanations from different teachers depending on their experience and expertise in the subject.
- VC is a solution to the recently emerged courses/disciplines that are difficult to get experts in remote locations.
- The information shared is common to all the students and also it does not deviate from the original meaning of the content, as it is delivered by the well prepared and experienced teachers.
- VC is the solution to the increase in number of students, both in regular and distance/open education modes.

Future Benefits of Virtual Classroom

- The archives of lectures and discussions will be made available topic-wise on the network, and students would be allowed to access the archives at anytime. The recorded videos are stored after sequencing them by editing, so the unnecessary discussions are removed from video.
- In the traditional classroom situation, the teacher introduces the fundamentals and then explains the concept, and finally end into discussion. Most of the precious time is spent on the introduction and explanation, and less opportunity is given to share the ideas of students and clarify their doubts. But in VC, the availability of recorded videos of previous lectures and discussions will reduce the time spent for introduction and explanation unless if any new concepts are to be introduced. Automatically the lecture time is reduced and discussion time is increased.

This also enables the future classes to discuss and clarify the very new ideas and doubts respectively.

- The VC pushes the students' community to attain the higher order cognitive skills from the discussions of new ideas and applications, instead of simply listening to the lectures.
- Finally, the above cycle in VC environments will make the educational institutions to maintain such a powerful knowledge management system that involve effective acquisition, sharing, utilization and creation of knowledge.

Conclusion

The advancement in modern technologies introduces a number of new approaches to follow in teaching-learning, and many of these are still to be tested in real environments. So, the application of technologies those go in hand with the traditional learning environments are always supported by the teaching community. VC is the modern approach that extends the traditional classroom to remote by including some advanced Information and Communication Technologies, and so this is not entirely a new approach rather an extension of existing system.

In the present situation, there are chances for misinterpretation of concepts from its original form or not reaching the complete content to the students, and such a circumstance will not provide opportunities to continue the discussions in right direction. The experienced and expert teachers in VC will terminate such chances, and the discussions are widened to a large group of students.

Application of modern technologies in to the areas of teaching-learning mostly depends on the learners' interest as they often designed for self-learning. The success of VC in future depends on the seamless connection between TE and SEs and effective exchange of ideas, and participation of students with interest.

References

[1]. Jackson P.W (1986). *The practice of teaching.* New York: Teachers College Press

[2]. Brooks J.G and Brooks M.G (1993). *In search of understanding: The case for constructivist classrooms.* Alexandria, Virginia: Association for Supervision and Development.

[3]. Starr Roxanne Hiltz. The Virtual Classroom (1994): *Learning Without Limits Via Computer Networks.* Intellect Books.

[4]. World Education Forum (26-28 April 2000 Dakar, Senegal). *The Dakar framework for action, Education for All: Meeting our collective commitments.* UNESCO.

[5]. Gaurav Chadha and S.M. Nafay Kumail (2002). *E-Learning-An Expression of the knowledge economy: A highway between concepts and practice.* Tata McGraw-Hill Publishing Company.

[6]. Supriya N. Pal, Param J. Singh, Ravi K. Sinha, L. Prakasa Rao, Sailaja P and Harish S. Bohra (Nov 2005). VARTALAAP Virtual Classroom System. *ICDE International Conference.*

[7]. Dr. G. B. Jaiprakash Narain, P. Sivakumar and G. Kulanthaivel (Jan 2006). ICT Enabled Technical Teacher Training (Virtual Learning Environment) Utilisation of EDUSAT Services. *EDUSAT Users' Meet: Southern Region.*

[8]. Chetana H Kamlaskar (Aug 2007). Virtual Classroom Modules for Basic Electronics Course at YCMOU: An Overview. *International Journal of Instructional Technology & Distance Learning.*

[9]. Indrajit Bhattacharya and Kunal Sharma (2007). India in the Knowledge Economy: An Electronic Paradigm. *Asian Journal of Distance Education*, pp 40-53.

ABOUT THE AUTHORS

M. Parthasarathy is specialized in computer aided instruction. He has been associating himself with the task of designing general and educational purpose software applications (www.skillstack.com), and also skilled in video editing, audio editing and developing interactive multimedia packages.

Dr. R.Ananthasayanam is a Prof. & Head, Department of Educational Technology, Bharathiar University, Coimbatore. His area of specialization is Educational Media Research and Educational Psychology. Ten Ph.D. and eight M.Phil. have been awarded under his guidance. Published more than 42 research papers in National and International journals. Completed two major research Projects on Multimedia Approaches to Adult Learning and Comparative Study of Distance Learning and Formal Education Systems funded by UGC and International Council for Distance education respectively. He may be reached via e-mail at ananth_edutech@rediffmail.com

Dr. R. Ravi is working as Assistant Professor in Education, Karunya University, Coimbatore. His area of specializations are Educational Technology, Educational Psychology and English Language Education. Currently he is working in the area of Multiple Intelligences and their applications for teaching and learning purposes. He is available at uniravi@rediffmail.com