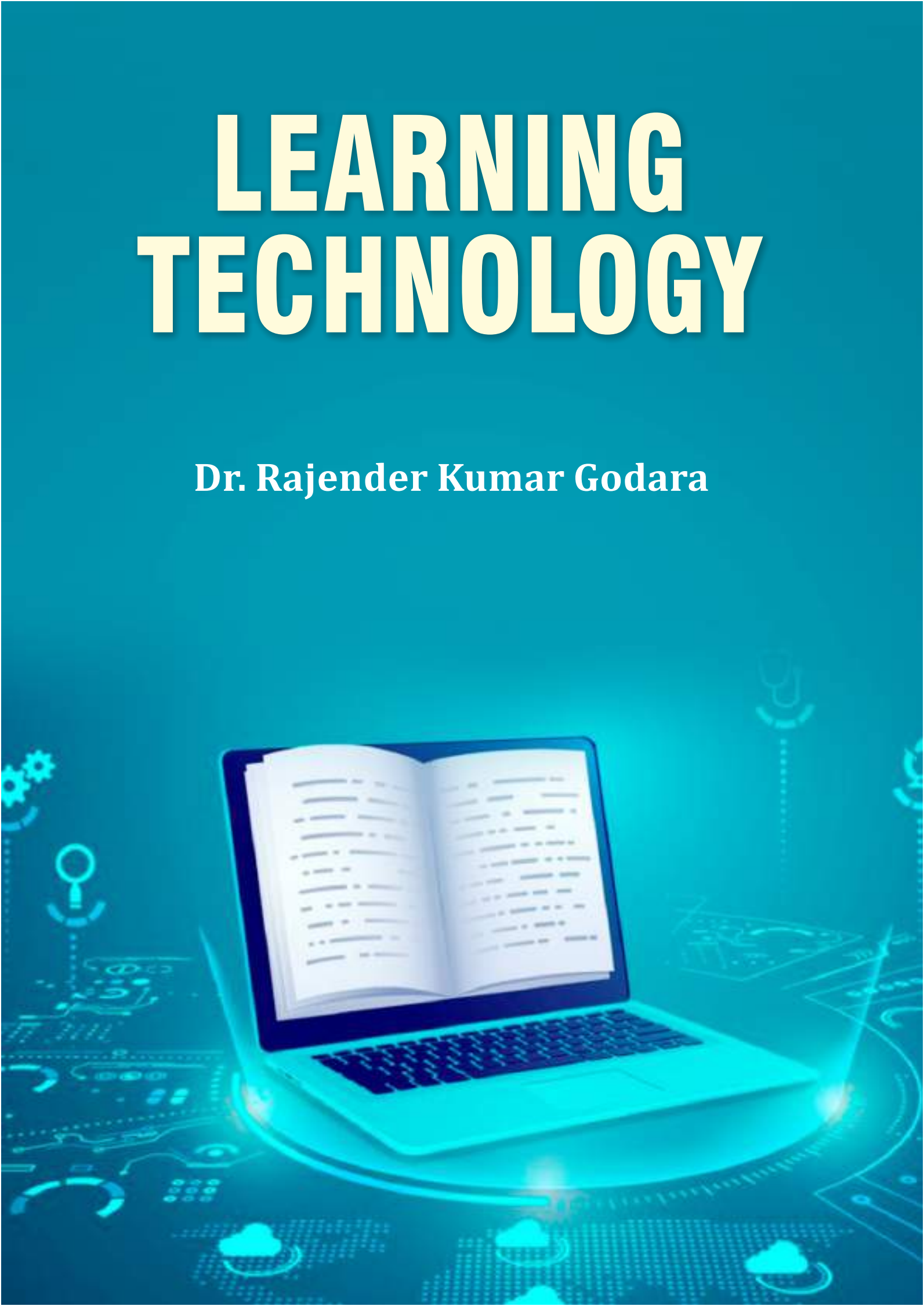
LEARNING TECHNOLOGY

Dr. Rajender Kumar Godara



Learning Technology

Learning Technology

Dr. Rajender Kumar Godara (Dean)
M.A. (Political Science) M.Ed., Ph.D. (Education),
Faculty of Education, Tantia University, Sri Ganganagar

ACADEMIC
UNIVERSITY PRESS

Learning Technology
Dr. Rajender Kumar Godara

ACADEMIC
UNIVERSITY PRESS

4378/4-B, Murarilal Street, Ansari Road, Daryaganj, New Delhi-110002.
Ph. No: +91-11-23281685, 41043100, Fax: +91-11-23270680
E-mail: academicuniversitypress@gmail.com

Year of Publication 2024-25

ISBN : 978-93-6284-763-8

Printed and bound by: Global Printing Services, Delhi
10 9 8 7 6 5 4 3 2 1

Contents

Preface

Learning technology, a broad and dynamic field, encompasses various tools, platforms, and methodologies aimed at enhancing the teaching and learning experience. It spans from traditional resources like textbooks and chalkboards to modern innovations such as virtual reality simulations and artificial intelligence-driven adaptive learning systems. This diversity enables educators to cater to a wide range of learning preferences and needs, facilitating engagement and deeper understanding among students.

The integration of multimedia resources, interactive platforms, and collaborative tools into educational settings provides opportunities for active and experiential learning. For instance, students can engage with interactive simulations to explore complex concepts, participate in online discussions to exchange ideas with peers globally, or use multimedia resources to enhance comprehension and retention of information. Such interactive and engaging experiences foster deeper learning and promote critical thinking skills.

Moreover, learning technology transcends physical boundaries, enabling access to educational resources and opportunities regardless of geographical location or time constraints. Through online courses, digital libraries, and educational apps, learners can access a wealth of information and learning materials at their convenience, promoting self-directed and lifelong learning. This democratization of education contributes to narrowing educational disparities and fostering inclusive learning environments.

However, effective integration of learning technology requires careful consideration of pedagogical goals, technological capabilities, and ethical considerations. Educators must critically evaluate the potential benefits and drawbacks of different technologies, ensuring alignment with learning objectives and the needs of diverse learners. Additionally, issues related to digital literacy, privacy, and equity must be addressed to ensure fair and ethical use of technology in education.

Professional development and ongoing support for educators are essential for leveraging the full potential of learning technology. Training programs and workshops can empower educators with the knowledge and skills needed to effectively integrate technology into their teaching practices, promote innovation, and address challenges that may arise. Moreover, collaborative learning communities and peer networks provide opportunities for sharing best practices, troubleshooting issues, and fostering continuous improvement in educational technology integration.

This book learning technology holds immense potential to transform education by enhancing engagement, promoting active learning, and expanding access to educational opportunities. However, its successful integration requires thoughtful planning, ongoing support, and a commitment to addressing ethical and equity considerations. By harnessing the power of learning technology, educators can create dynamic and inclusive learning environments that empower students to succeed in the digital age.

Exploring the transformative potential of learning technology, this book navigates the evolving landscape of educational innovation and its impact on teaching and learning.

–Author

1

Introduction

Information technology is increasingly becoming the catalyst for economic and cultural change. Unfortunately, "this rise of informationalism … is intertwined with rising inequality and social exclusion throughout the world" (Castells 1998:70). Sadly, a growing number of sub-Saharan African communities, including adult learners, are continuously being excluded from the benefits of this information technology revolution.

Distance education is undoubtedly the most affordable means for adult learners to specialise and retrain for new tasks and challenges in order to remain competitive in the global economic environment. According to Collins and Berge (1994) and McConnell (1994), the technology that can be used to implement new visions of open distance learning with the networked computer is emerging. Opportunities now exist for supporting interinstitutional links and collaborative learning experiences. However, in most the underdeveloped communities, access to networked information technology is limited. At the University of South Africa, for example, one of the largest distance education institutions in Africa, efforts to use technology are continuously sidelined because approximately 90% of the student body do not have access to computers and/or television.

Two tools are required to make information technology beneficial to members of society: gaining access and acquiring the capacity to make meaningful use of it.

But unless educators initiate and conduct research into constructive and contextualised solutions to accessing and utilising these new technologies, taking into account the sociocultural variables, the specific learning needs and the limitations of the host institutions, communities in this part of the world will remain disenfranchised.

This discussion is an attempt to develop a conceptual framework as a guideline for designing contextualised, technology-enhanced learning environments for distance learners. Hopefully, such a framework could then form the basis for conducting research in this area. It is an attempt to locate and nuance a flexible and adaptable course-designing process in a South African environment.

The Framework Constructs

Six underlying theoretical constructs underpin the exploration and analysis in this discussion:

- The constructivist learning theory
- Salomon's reference to the learning environment (LE) as the locus for change (including technological adaptation)
- Miller's socio-technical systems approach to designing distance learning materials
- Castells' space of flows theory
- Wort's distance provision framework
- Dahllöf's interactive process-centred approach to the evaluation of teaching.

A synthesis of these six constructs provides an investigative framework and a possible methodological approach for a later study, as no documented and tested framework or methodology for designing and evaluating technology-enhanced courses for distance learning environments is available yet.

The Constructivist Learning Theory

Although contructivism is not a learning theory, it is has come to be regarded as such by a number of educators, particularly mathematics and science educators. Constructivist learning theory is a general framework for instruction based upon the study of cognition and has its roots in psychology and philosophy. Although the early pioneers such as Vygotsky, Piaget and Dewey did not refer to themselves as constructivists, their work has contributed to what is now considered to be constructivist thought. Much of the theory is linked to Piaget's work on cognitive development research (Kahn & Volmink 2000:5), Dewey's rejection of passive learning in favour of meaningful engagement in the learning task (Hawkins in Fensham et al 1994:6) and Vygotsky's emphasis social cultural context of learning (Barber 1995:92).

What we now call constructivism is based on the assumption that learners construct their own understanding of the world. Briner's statement on learning captures this line of thought when he states that "Learning is an active process in which learners construct new ideas or concepts based upon their current/past knowledge. The learner selects and transforms information, constructs hypotheses, and makes decisions, relying on a cognitive structure" (Briner 1999:1).

The emphasis is on learning rather than teaching, and on facilitative environments rather than instructional goals. According to Young and Marks-Maran (1988), learning is an active cognitive process in which individuals strive for understanding and competence on the basis of their personal experience. Lave (1988) speaks of "situated cognition", which means that learning is best achieved when learning tasks are encountered, practised and applied in real-world contexts. It is also useful to have the assistance of experts and supportive others through apprenticeship and collaboration. How constructivism can be realistically incorporated into a course-designing process using networked technology in a South African distance education programme needs to be established.

ASSESSMENT OF LEARNING OUTCOMES

Learning and learner performance have to be appropriately assessed. Again, a wide range of strategies may be applied as part of this process. The choice of these will vary according to the intended learning outcomes and the learning tasks that were prescribed.

For example, if the nature of the learning task was more collaborative, situated and distributed in its context, conventional methods of assessment of learning outcomes would be inadequate. These will need to be replaced by cognitive tasks and assessment procedures that can focus on the processes of learning, perception, and problem solving. In addition, assessment could no longer be viewed as an add-on to an instructional design or simply as separate stages in a linear process of pretest, instruction, and posttest. Assessment must become an integrated, on-going, and seamless part of the learning environment.

The entire instructional design process will need to be changed from a serial stage model in which assessment enters and leaves, to a model in which processes that serve as instructional stimuli also serve to provide data to a multivariate model. Such a model would then be able to provide important feedback to both the instructor and the learner.

Assessment focusses on the learning process as well as the learning products. For instance, if learning changes from direct instruction to situated learning the assessment of successful and less successful learners (or experts and novices within a domain) must change from an emphasis on right and wrong responses towards an emphasis on the information that each student perceives in the situations. Meanings that each student perceives could be detected by types of information to which they attend (*e.g.*, replayed video scenes), paths taken towards solution, types of analogies and transfer that occur, and the types of errors that are made. These new sources of data will require more elaborate (multivariate and nonlinear) models.

Feedback and Remediation

Any instructional system which views learning as a process of mutual influence between learners and their instructional resources must involve some

feedback for, without feedback, any mutual influence is by definition impossible. From a review of research on effects of feedback in written instruction Kulhavy (1977) described four conditions of feedback: (a) that feedback corrects errors; (b) that the error-correcting action of feedback is more effective when it follows a response about which the learner felt relatively certain; (c) that the effectiveness of feedback is enhanced if it is delivered after the learner has made a response; and (d) that, if feedback is to be effective, its availability in advance of learner response must be controlled. It has been reported though that feedback delivered following learner response is beneficial only under controlled and somewhat artificial conditions (Kulik and Kulik, 1988). There is some evidence also that the amount of information in feedback is unrelated to its effects, and that feedback does not always increase achievement and is sometimes associated with decreased achievement (Bangert-Drowns, Kulik, Kulik and Morgan, 1991).

From these general assessments of the effects of feedback, several conclusions can be drawn about conditions of feedback. Foremost among these is that feedback is not a unitary phenomenon and that it may differ in several ways. First, feedback may differ according to its *intentionality.* This refers to whether feedback was designed to inform learners about the quality and accuracy of their responses, or it happened to be an *incidental* consequence of the instructional environment. Intentional feedback is typically found in direct and expository instructional settings, although informal feedback in such contexts has an important function in instructional events such as peer group interactions and unassisted group simulations.

Intentional feedback can be further differentiated according to the manner in which it is delivered. It may be delivered via direct interpersonal communication between instructor and learners or between learners. Alternatively, intentional feedback may be delivered in mediated forms such as telephonic and computer-based communication systems. In any event, intentional feedback is highly specific and directly related to the performance of the task.

Secondly, feedback can be distinguished according to its *target.* Some feedback is primarily designed to influence affective learning capacities such as intrinsic motivation. Feedback may be directed at supporting self-regulated learning activity by cueing on to the self-monitoring processes of the learner. Most commonly, though, feedback is targetted at indicating whether learners have performed the specified tasks or applied the learned concepts and procedures correctly.

Thirdly, feedback is distinguishable according to its *content,* which is identifiable by: (a) *load* (*i.e.*, the amount of information given in the feedback from yes-no statements to fuller explanations); (b) *form* (*i.e.*, the structural similarity between information in the feedback compared to that in the instructional presentation); and (c) *type of information* (*i.e.*, whether the feedback restated information from the original task, referred to information given elsewhere in the instruction, or actually provided new information.

E-LEARNING 2.0

The term e-Learning 2.0 is used to refer to new ways of thinking about e-learning inspired by the emergence of Web 2.0. From an e-Learning 2.0 perspective, conventional e-learning systems were based on instructional packets that were delivered to students using Internet technologies. The role of the student consisted in learning from the readings and preparing assignments. Assignments were evaluated by the teacher. In contrast, the new e-learning places increased emphasis on social learning and use of social software such as blogs, wikis, podcasts and virtual worlds such as Second Life. This phenomenon has also been referred to as Long Tail Learning See also, "Minds on Fire:Open Education, the Long Tail, and Learning 2.0" by John Seely Brown and Richard P. Adler, 2008.

The first 10 years of e-learning (e-learning 1.0) was focused on using the internet to replicate the instructor-led experience. Content was designed to lead a learner through the content, providing a wide and ever-increasing set of interactions, experiences, assessments, and simulations. E-learning 2.0, by contrast (patterned after Web 2.0) is built around collaboration. E-learning 2.0 assumes that knowledge (as meaning and understanding) is socially constructed. Learning takes place through conversations about content and grounded interaction about problems and actions. Advocates of social learning claim that one of the best ways to learn something is to teach it to others.

There is also an increased use of virtual classrooms (online presentations delivered live) as an online learning platform and classroom for a diverse set of education providers such as Fox School of Business for Temple University, Minnesota State Colleges and Universities, and Sachem School District.

In addition to virtual classroom environments, social networks have become an important part of E-learning 2.0. Social networks have been used to foster online learning communities around subjects as diverse as test preparation and language education. Mobile Assisted Language Learning (MALL) is a term used to describe using handheld computers or cell phones to assist in language learning.

3D VIRTUAL LEARNING ENVIRONMENTS

As another example, Second Life has recently become one of the virtual classroom environments used in colleges and universities, including University of Edinburgh (UK), Harvard University (USA), and the Open University (UK),. Language learning in virtual worlds is the most widespread type of education in 3D virtual spaces, with many universities, mainstream language institutes and private language schools using 3D virtual environments to support language learning.

SERVICES

E-learning services have evolved since computers were first used in education. There is a trend to move towards blended learning services, where computer-based activities are integrated with practical or classroom-based situations.

COMPUTER-BASED LEARNING

Computer Based Learning, sometimes abbreviated to CBL, refers to the use of computers as a key component of the educational environment. While this can refer to the use of computers in a classroom, the term more broadly refers to a structured environment in which computers are used for teaching purposes. The concept is generally seen as being distinct from the use of computers in ways where learning is at least a peripheral element of the experience (*e.g.*, computer games and web browsing).

COMPUTER-BASED TRAINING

This section needs additional citations for verification.

Please help improve this article by adding reliable references. Unsourced material may be challenged and removed. (September 2007)

Computer-based training (CBT) services are where a student learns by executing special training programmes on a computer relating to their occupation. CBT is especially effective for training people to use computer applications because the CBT programme can be integrated with the applications so that students can practice using the application as they learn. Historically, CBTs growth has been hampered by the enormous resources required: human resources to create a CBT programme, and hardware resources needed to run it. However, the increase in PC computing power, and especially the growing prevalence of computers equipped with CD-ROMs, is making CBT a more viable option for corporations and individuals alike. Many PC applications now come with some modest form of CBT, often called a tutorial. Web-based training (WBT) is a type of training that is similar to CBT; however, it is delivered over the Internet using a web browser.

Web-based training frequently includes interactive methods, such as bulletin boards, chat rooms, instant messaging, videoconferencing, and discussion threads. Web based training is usually a self-paced learning medium though some systems allow for online testing and evaluation at specific times. Recent years have seen an explosion in online training for educators by content providers such as Knowledge Delivery Systems, Atomic Learning, PBS Teacherline, and more.

COMPUTER-SUPPORTED COLLABORATIVE LEARNING (CSCL)

"Computer-supported collaborative learning (CSCL) is one of the most promising innovations to improve teaching and learning with the help of modern information and communication technology. Collaborative or group learning refers to instructional methods whereby students are encouraged or required to work together on learning tasks. It is widely agreed to distinguish collaborative learning from the traditional 'direct transfer' model in which the instructor is assumed to be the distributor of knowledge and skills. " Lehtinen et al.

Computer-supported collaborative learning (CSCL) is a method of supporting collaborative learning using computers and the internet. It is related to Computer Supported Cooperative Work (CSCW) and cuts across research in psychology, computer science, and education.

The technology allows individuals who are far apart to collaborate on-line. The use of these tools is increasing, however many teachers are still new to what tools are available on the internet and how to use them effectively. This article details some of the tools available and suggests ways to use them to promote online learning and the collaboration of students.

ABOUT CSCL

CSCL is a method for bringing the benefits of collaborative learning and cooperative learning to users of distance or co-locative learning via networked computers, such as the courses offered via the Internet or in a digital classroom. The purpose of CSCL is to scaffold or support students in learning together effectively. CSCL supports the communication of ideas and information among learners, collaborative accessing of information and documents, and instructor and peer feedback on learning activities. CSCL also supports and facilitates group processes and group dynamics in ways that are not achievable by face-to-face communication (such as having learners label aspects of their communication).

CURRENT RESEARCH

Due to the surge of distance learning via the Internet, including courses that employ CSCL, it is important that educators and instructional designers better understand the benefits and limitations of CSCL. Like many educational activities, it is difficult to evaluate the effectiveness and efficiency of CSCL activities. Early efforts focused on suspected detrimental effects of communication filtering of computer mediated communication (CMC) and ignored the potential benefits of CMC. Historically, the lack of evidence that technological innovations have improved learning in formal education highlights the need for evidence of whether, how and when expected improvements in learning take place.

A key characteristic of CSCL research is its diversity in methodology: CSCL researchers apply laboratory experimental methods, quasi-experimental approaches, discourse analyses, or case studies. Qualitative data shows high regard for use of CSCL tools as aides to learning in the classroom.

MEANS AND MEDIUMS

Online Collaboration tools are the means and mediums of working together on the Internet that facilitate collaboration by individuals who may be far apart. The use of collaborative tools is increasing, however many teachers are still new to what tools are available on the internet and how to use them effectively.

BENEFITS

If Collaborative learning is the idea of bringing together learners to work and learn in a collaborative manner, then Computer Supported Collaborative Learning (CSCL),or Web 2.0, tools accomplishes this task either synchronously or asynchronously. {See Asynchronous Learning} Online collaborative tools provide a central locale for these types of interactions.

- Saves time. Students can work either together or independently, either way contributing to the success of their group overall.
- Develops oral and written communication and social interaction skills.
- Allows for interactions with students outside their class, school, city, state and even country. Prepares young students for upper grades and the technology tools they will be encountering there.
- Allows for students who are unable to attend school to keep up with their peers.
- Share ideas.
- Increases student motivation.
- Encourages different perspectives views.
- Aids in metacognitive and evaluative thinking skill development.
- Develops higher level, critical-thinking skills thanks to use of problem-solving approaches.
- Encourages student responsibility for learning.
- Establishes a sense of learning community.
- Creates a more positive attitude about learning.
- Promotes innovation in teaching and classroom techniques.
- Enhances self management skills.
- Develops skill building and practice. Common skills which often require a great deal of practice can be developed through these tools, and made less tedious through these collaborative learning activities in and out of class.
- Develops social skills.

AVAILABLE TOOLS

A variety of tools are available via the Internet to assist in online collaboration efforts.

Wikis: Wikis are a type of website in which users, such as students, can easily add, remove, or edit the content.

APPLICATION IN EDUCATION

Teachers can engage students by using wikis to create a space for collaborative essays. Students can posts their reflections and share information. Students working collaboratively on research projects can use wiki spaces as a depot for note taking, or to learn from other student research projects. Teachers can also create a compendium of concepts for the course to use as a study guide. Wikis

can serve as teacher or classroom webpages, with the added benefit that students themselves can edit the content. For example, students can change the page that displays the weeks' spelling words.

Blogs: Blogs are interactive, online journals.

Teachers may write a blog for students in their classrooms with links to Internet sites which aide in learning and/or research tasks. Teachers may have students use blogs as learning reflections, story writing, *etc.* Viewers can leave comments which aide the writer in his/her writing development.

Learning Management Systems: Learning management system (LMS) or course management systems (CMS) are an online package to help educators create effective online learning communities.

Teachers can post discussion topics, questions, homework or resources in the forums, and answer questions or send messages online. Or they can set quizzes for test review. It can provide a secure place for email exchange. A CMS helps to establish a learning community online. For home-bound children, a CMS can provide the learning experience and collaborative opportunities missed in the classroom.

Survey Systems: These tools allow the creation and administration of surveys completely online.

These tools are great for both teachers and students. Surveys can easily be turned into quizzes with multiple choice answering, and open-ended questioning. The survey can render your results for you, and even synthesize and analyze the results into a variety of formats including charts and graphs.

Online Image/Video Sharing: These tools allow for the sharing of image and video files specifically and often allows commentary, dialogue and/or exchanges.

Teachers and students can use these tools to discuss and analyze photos, videos, *etc.* They can upload pictures or video from their computer, camera, or from cell phone. It's a great place to store and organize photos and videos, however it is not entirely secure.

The students can then actively engage with the image and think about and discuss specific aspects. Specifically in applications such as Flickr, students can organize pictures by tags. As a collaboration project, teachers can encourage students to upload pictures about a topic, for example a world heritage site, and invites users to contribute tags to the images.

In applications, such as VoiceThread, students can add voice and written commentary to the overall video, picture or document. The comments are sequenced, so that late-comers can follow the dialogue.

Video-conferencing/chat/file Sharing Applications: These are various applications which allow students from around the world to engage in synchronous conferencing through live video feeds, video replays, chatting, and/or voice.

Teachers can create online working spaces for student groups within their classrooms, across classrooms, grade levels, school, states, the nation, and even the world. Students can work collaboratively on group assignments, and keep active communications ongoing with e-pals.

Online Collaborative Work Spaces: Various web-based applications which allow groups of students to work together on common documents in various formats either synchronously or asynchronously. Many applications include to-do lists, calendars, and ample storage space. These spaces are not always secure, however. Some applications include blogs and wikis for group work, as well.

You can upload various types of documents or spreadsheets, even PowerPoint presentations in many applications and have students work entirely online asynchronously on a product. Partners and groups can be inside the same classroom, or across the country or world from one another.

Online Whiteboards: Various web-based applications which allow students to chat, while writing, drawing, demonstrating, *etc.,* in/on an electronic whiteboard. Often these applications let you save what has been written on the whiteboard as a picture file, and/or print them.

In these types of Web 2.0 tools, students can brainstorm, create graphics together, and engage in peer-to-peer tutoring in skills and concepts such as multiplication or division. These can often be video-taped to show process, and/or saved as an image file and printed for review.

Virtual Worlds: Virtual worlds are areas online where students can interact with each other with avatars.

Virtual Worlds, such as Whyville, have much potential in Education by providing fun, highly motivating, places for collaboration. In these virtual worlds new snippets are constantly being added that provide additional functionality to the system. This environment provides ample opportunity for social skills development and writing/reading skill development through a fun, non-intimidating manner.

Mind Maps: Mind maps are diagrams used to represent words, ideas, tasks, or other items.

Teachers can utilize brainstorming approaches that can generate ideas without regard for a more formal, hierarchical organization system. Notetaking, organizing, connecting, summarizing, revising, and general clarifying of thoughts can be accomplished with this tool.

Teacher's Role: Instructors play a vital role in facilitating online collaborative learning. Researchers indicate that strong instructor support, frequent instructor-student interaction, and superior organizational skills are critical elements of successful online collaborative learning (Ku, Lohr, & Cheng, 2004). According to the Shank study, competencies of online instructors and those planning the use of online collaboration tools in the traditional classroom setting, are as follows:

Administrative: The primary goal is to assure smooth operations and reduce instructor and learner overload.

Design: The primary goal is to assure successful learning outcomes.

Facilitation: The primary goal is to provide social benefits and enhanced learning.

Evaluation: The primary goal is to assure that learners know how they will be evaluated and help learners meet objectives.

Technical: The primary goal is to assure that barriers due to technical components are overcome.

TECHNOLOGY-ENHANCED LEARNING (TEL)

The existing definitions for technology enhanced learning spread very broad and change continuously due to the dynamic nature of this evolving research field(see example links below.) Hence, the definition of TEL must be as broad and general as possible in order to capture all aspects:

Technology enhanced learning (TEL) has the goal to provide socio-technical innovations (also improving efficiency and cost effectiveness) for learning practices, regarding individuals and organizations, independent of time, place and pace. The field of TEL therefore describes the support of any learning activity through technology.

> *A learning activity can be described in terms of the:*
> *Learning Resources: creation, distribution, access, compilation, consumption of digital content; tools and services*
> *Actions: communication, collaboration, interaction with software tools*
> *Context: time and location*
> *Roles: A learning activity is carried out by various actors in changing roles (e.g., student, teacher, facilitator, learning coach, human resource or education manager).*
> *Learning Objective: to support every human in achieving her or his learning goals, respecting individual as well as organizational learning preferences. Learning activities can follow different pedagogical approaches and didactic concepts. The main focus in TEL is on the interplay between these activities and respective technologies. This can range from enabling access to and authoring of a learning resource to elaborate software systems managing (e.g., learning management system, learning content management systems, learning repositories, adaptive learning hypermedia systems, etc.) and managing (human resource management systems; tools for self-directed learning, etc.) the learning process of learners with technical means.*

TEL is often used synonymously for e-learning even though there are significant differences. The main difference between the two expressions is that TEL focuses on the technological support of any pedagogical approach that utilizes technology. However this is rarely presented as including print technology or the developments around libraries, books and journals in the centuries before computers.

THE LEARNING ENVIRONMENT (LE) AS THE LOCUS FOR CHANGE

Salomon (1991) describes a learning environment (LE) as a system consisting of interrelated components that jointly affect learning in interaction with (but separate from) relevant individual and cultural differences. He suggests that

when technology is introduced to the LE, the changes in the individual will depend on the changes distributed over the whole learning environment. Salomon's (1996:366) phenomenological approach guides the development of the conceptual framework proposed in this article. He uses an investigative approach which combines analytic and systemic processes to study the generic components of the LE as perceived and experienced by its inhabitants (teachers and learners). The analytic process involves an elucidation of the components in terms of their contents, while the systemic process involves mapping out patterns of configurations of relations between these components.

Salomon's generic components of the LE include:

- A teacher and his/her teaching qualities
- Relations and interactions of the learner
- Rules and regulations governing the LE
- Consensually held view of participants as learners
- The mental effort they are willing to expend in learning.

In a study involving the University of Arizona Science faculty (staff), high school students and teachers in Tucson, Arizona, Salomon took pre and post measures of the learning environment components for a group of high school students involved in a science course. The experimental group of students used advanced technologies while the control group did not. The results were then submitted to a multidimensional scaling (MDS) analytic tool separately for both the experimental and control group. The resulting patterns clearly showed differences in the structures of the traditional and technology-enhanced LEs (Vosniadou, De Corte, Glaser & Mandl 1996:370). While Salomon's approach focuses on the changes in the observed individual learning as technology is introduced, it has minimal reference to the interaction of the learner with the course material content, and the relations of the teaching organisation with its immediate external and internal environments. The other constructs provide means of accommodating these aspects.

Miller's Socio-technical Systems Dramework

Miller (1998) considers the course development process to be dynamic with a number of critical interactions with external factors, such as the political environment, managerial and organisational issues, and the personal and professional settings of the participants. Miller suggests using the systemic approach for developing and evaluating a course in an organic rather than a mechanistic fashion in order to deal with the dynamic human interactions.

Her proposed sociotechnical systems framework consists of five subsystems:

- Technical (educational activities and curriculum)
- Psycho-socio (interactions, expectations, values of the participants)
- Organisational structure (materials and tutoring)
- Institutional (structural working of institution)
- The environmental (workplace and personal environment).

Miller's approach provides a way of understanding the processes of interaction between students' involvement with the course material in the particular context of their work. It does not deal very structurally with critical interactions within the distance education environment, however. Wort's (1998) work deals with this aspect.

Wort's Distance Provision Dramework

Wort's (1998:196) framework emphasises examining the critical interactions within the education process:

- Learner-teacher
- Learner-content
- Teacher-content
- Learner-learner interactions.

Wort suggests using these dimensions as bases for analysing the learning process where the intended learning outcomes form the central focus. The analysis of these interactions uses Boot and Hodgson's (1987) comparison continuum scale involving two basic orientations to open and distance learning: a dissemination approach which is concerned with effective information provision and a developmental approach which focuses on the intellectual and personal growth of the learners.

Wort's model is crucial because it focuses on the learning interactions within a distance learning environment. The position of "distance" in the learning process affects teaching roles, instructional methods and learner expectations, depending on the projected learning experience. To understand the effects of introducing technology clearly, the characteristics of these interactions need to be defined.

Castells' space of flows theory and Dahllöf's interactive process-centred approach to the evaluation of teaching fill in the remaining gaps required to construct this framework By introducing a spatial dimension to the technology process, Castells' approach suggests the need for a deeper level of inquiry in explaining how learning is different when technology is employed. Dahllöf's model brings all the constructs together.

Castells' Space of Flows Theory

Castells (1996:411) developed his space of flows theory stems from perceiving space "as the material support of time-sharing social practices". Castells contends that the new information technology revolution is creating new spatial forms and processes. He describes the space of flows as a new spatial process which allows for simultaneity of social practices without territorial or physical contiguity.

The contents of Castells' space of flows raises new questions about the influence of technology on educational practices, such as how this new spatial configuration affects the nature of the learning process.

Dahllof's (1991) Interactive Process-centred Approach to Evaluating Teaching

The strength of Dahllof's (1991) approach is its degree of comprehensiveness (attempting to accommodate many of the components of an LE). Their structural approach allows for evaluation at course and at programme level, and is suitable and is suitable for academic, professional and vocational courses. They use the terms "evaluation for internal efficiency" and "evaluation for external efficiency" to differentiate between the two modes of analysis.

The internal mode deals with issues associated with a specific course whereas the external mode can accommodate issues at programme, institutional and societal levels.

The main components of their structure are:

- The actors, namely the
  - Student groups (with their profiles)
  - Teachers or competence teams (their experiences and limitations)
  - Management (leadership styles and skills)
- Frames factors which are parts of the LE subject to decisions at higher levels (eg, the programme/course structure or curriculum, time available for a given course or programme, human and material resources and rules governing the allocation and use of these resources)
- Learning and teaching processes, specifically in terms of time spent, methods used and assessment strategies employed in teaching topics or courses
- The outcomes, which involve a combination of the actual outputs (expressed in terms of student achievement and degrees of satisfaction with the courses) with the intended goals of the programmes or courses.

Dahlöff (1991:18) is aware of the distinctions that exist in post-secondary institutions in terms of orientation to academic (theoretical) and practical (professional and/or vocational) methods of training, but are emphatic that "understanding and practice are complementary, the one facilitating the other".

They stress that although specific courses and programmes should have specific goals and outcomes, higher education goal and outcome formulation should demand

- In-depth understanding of mechanisms within a specific field of study
- Insight into the basis and limitations of research in the given field
- Learners' ability to communicate the relevant concepts and insight effectively.

Dahllöf's (1991:117, 147) approach is further strengthened by the realisation that "evaluation is best served if the teaching/learning process is viewed consistently from the perspectives of the student group involved" and should

not only be focused on the "testing of achievement in examinations, accreditation procedures or both". Rather, they are in favour of an overall emphasis on and interplay between student characteristics and enrolment trends, strengths and limitations of staff, impact of frame conditions, instructional methods and time used for teaching and learning, and the links between planned learner course and unit outcomes and actual student achievement.

Suggested Framework

The suggested framework for designing technology-enhanced distance learning environments for adult learners is a modified version of Dahllöf et al's model for components used in institutional evaluation, with inputs from Miller's structure of sub-systems, Salomon's methodological approach for demarcations of the component boundaries and Wort's framework for distance provision. These baselines are greatly influenced by a constructivistic approach and Castells' general views about technological adoption.

The proposed LE framework will consist of the following components:

- Individual learner group profiles (including views, values and expectations)
- Teacher competencies, experiences, strengths and
- Limitations management styles and skills
- Frame factors (course/programme structure or curriculum, human and material resources, organisational and institutional rules/ regulations)
- The learning and teaching process (including all the interactions, instructional methods, assessment strategies)
- Overall outcomes with the outputs (performance results) and learning goals, and the attitudes
- External conditions, including societal, cultural, economic, workplace and market conditions, educational demands.

Possible Uses of the Framework

This type of framework could then be used to examine how the dynamics of a distance learning environment change when technology is introduced. For example, a possible approach could involve

- Identifying the configuration of the components in the LE by mapping the interactions between them
- Examining how the configuration changes as a result of technological intervention.

Presumably, the process of locating and identifying variables in the learning environment and the adult learner, and analysing them in both traditional and technology-enhanced environments, will illuminate the configuration characterising

a technology-enhanced LE. Ultimately, this process would help teachers/instructors in making design decisions concerning technology adoption. Although a likely methodology would mainly be a study of interactions of the adult learner with the other components and the technology adopted, it would also involve an analysis of course material and structure, managerial and organisational issues, and interactions of the teaching organisation with its immediate external and internal environments (cultural, political and economic).

Questions that Need to be Dealt With in Technology Adoption

There is a need to pay attention to identifying tensions and constraints which affect the functionality of the LE, and to carefully analyse the impact of introducing technology. In the case of web-based technology, for instance, questions concerning the transformation of the interaction space of the LE would be critical. It would be important to find out how the new spatial configuration would affect the nature of the learning process, content and interactions within the LE, and what effect the unrestrained boundaries would have on the institutional and organisational structures.

In more general terms, important questions would seek to influence future technology adoption, such as:

- What crucial issues should be dealt with in designing technology-enhanced LE's in distance education?
- What are the cost-benefit trade-offs associated with each design issue? (The costs and benefits relate to the effects on student learning and motivation, and to the costs in time of money and effort required to implement and maintain aspects of the LE.)

Educators should be asking vital questions that seek to monitor the teaching/learning processes and their outcomes and, if possible, to improve them, such as:

- What are the ongoing distance education practices? How do we characterise them?
- What is the vision of an appropriate pedagogy? What is desirable? What is possible?
- In what ways can technology make a genuine difference?

We are at an exciting phase of technological and communication advancement and in fact, technological adoption can be used to transform and improve distance education practice. However, unless underpinned by informed research, the enthusiasm about technological adoption could prove to be more futile than fruitful. As Salomon (2000:7) aptly advises "let technology show us what can be done and let educational considerations determine what will be done".

DISTANCE LEARNING TECHNOLOGIES

Until the advent of telecommunications technologies, distance educators were hard pressed to provide for two-way, real-time interaction, or time-delayed

interaction between students and the instructor or among peers. In the correspondence model of distance education, which emphasized learner independence, the main instructional medium was print, and it was usually delivered using the postal service. Interaction between the student and the instructor usually took the form of correspondence of self-assessment exercises that the student completed and sent to the instructor for feedback. Formal group work or collaborative learning was very rare in distance education, even though attempts have been made to facilitate group activities at local study centers. Also, traditionally, distance education courses were designed with a heavy emphasis on learner independence and were usually self-contained. With the development of synchronous (two-way, real-time interactive) technologies, such as audio teleconferencing, audio graphics conferencing, and videoconferencing, it is now possible to link learners and instructors who are geographically separated for realtime interaction. However, the type of interaction that takes place is usually on a one-to-one basis, between one learner and another and between one learner and the instructor at one particular time. These technologies are not very suitable for promoting cooperative learning between groups of learners located at different sites. Also, the synchronous nature of these technologies may not be suitable or convenient for many distance learners.

The asynchronous feature of computer mediated communications, on the other hand, offers an advantage in that the CMC class is open 24 hours a day, 7 days a week, to accommodate the time schedules of distance learners. Although CMC systems may be either synchronous (real time) or asynchronous, it is asynchronous CMC, because of its time-independent feature, that is an important medium for facilitating cooperative group work among distance learners.

Current developments in digital communications and the convergence of telecommunications technologies, exemplified by international standards such as ISDN (Integrated Services Digital Network), make available audio, video, graphic, and data communication through an ordinary telephone line on a desktop workstation.

Therefore, as we look at distance learning technologies today and look to the future, it is important to think in terms of integrated telecommunication systems rather than simply video vs. audio vs. data systems. More and more institutions that teach at a distance are moving towards multimedia systems integrating a combination of technologies both synchronous and asynchronous that meets learner needs. Therefore, while in the 1970s ‘and 1980s many distance education institutions throughout the world used print as a major delivery medium, by the year 2000 many institutions will probably have adopted telecommunications-based systems for the delivery of distance education. This does not necessarily mean that print will no longer be used in distance education. It is more likely that print will be used as a supplementary medium in most telecommunications-based systems, and better ways of communicating information through print will be investigated and incorporated into the design of study guides and other print-based media.

In order to describe the technologies used in distance education, we have selected "The 4-Square Map of Groupware Options" that was developed by Johansen et al. (1991) which is based on recent research in groupware. This model seemed most suitable to our purpose, because we see distance education moving from highly individualized forms of instruction, as in correspondence education, to formats that encourage teaching students as a group and collaborative learning among peers. The "4-square map of groupware option" model is premised on two basic configurations that teams must cope with as they work: time and place. Teams or groups of people who work together *on a common goal deal with their work in the same place at the same time as in face-to-face meetings, and sometimes they must work apart in different places and at different times, as in the use of asynchronous computer conferencing. They also need to handle two other variations: being in different places at the same time, as in the use of telephones for an audio teleconference, and at the same place at different times, as in workplaces, study centers, or laboratories. Based on these configurations, the 4 square model classifies four types of technologies that support the group process: (1) same time/same place, (2) different time/different place, (3) same time/different place, and (4) same place/different time. These four categories are used for describing technologies that currently support distance teaching and learning.

While we use the 4-square model to discuss the major distance education technologies currently being used, we feel that this model does not lend itself very well to discussing new and future developments in integrated telecommunications. Since these integrated systems incorporate many of the features that we classify separately in the 4-square model, we have decided to describe new and future developments in a separate section titled "Future Directions and Emerging Technologies".

Same Time/Same Place Instruction

Same Time/Same Place group interaction is the most familiar format of face-to-face meetings. Certain objectives in distance education programmes can only be met by meeting face-to-face. The British Open University, which teaches entirely at a distance brings students on campus during the summer to participate in laboratory experiments. When course objectives require the careful demonstration, observation, practice and feedback of life threatening procedures such as a surgical procedure, it is important to organize face-to-face meetings. In a face-to-face setting accepted practices are only modified slightly to accommodate electronic media. Basic technologies that facilitate a face-to-face meeting involve an overhead projector, a flip chart, electronic blackboard or a projection system that displays computer screens via a LCD monitor. At the more sophisticated end are desk top workstations for each group member which run on special software that helps the group to brainstorm, generate ideas, rank solutions and vote. Also, a record of the group process can be produced at the conclusion of the groups' activities. IBM's Decision Conference Centre in

Bethesda, Maryland employs such sophisticated groupware to facilitate group decision making processes. However, innovative approaches are now being adopted to the design laboratory work at a distance by using technologies, as in the dissection of a fetal pig experiment that was designed by the University of Maine using a combination of two-way interactive television, videotape and group work at sites.

Same Time/Different Place Instruction

There are two kinds of Same Time/Different Place Instruction: 1. a meeting through a telecommunications medium or teleconferencing where participants who are separated by geographic distance can interact with each other simultaneously, and 2. the use of non-interactive media such as open broadcast television and radio to instruct a vast number of students at the same time without the ability for the students to call back and interact with the originators of the programme. Teleconferencing can be classified into four separate categories depending on the technologies that they use: audio teleconferencing, audiographics teleconferencing, video teleconferencing and computer conferencing. There are two types of computer conferencing: synchronous computer conferencing when two or more computers are linked at the same time so that participants can interact with each other, and asynchronous computer conferencing when participants interact with each other at a time and place convenient to them. Asynchronous computer conferencing is described under Different Time/Different Place instruction. The four major types of teleconferencing vary in the types of technologies, complexity of use and cost. However, they have several features in common. All of them use a telecommunication channel to mediate the communication process, link individuals or groups of participants at multiple locations, and provide for live, two-way communication or interaction.

One advantage of teleconferencing systems is that they can link a large number of people who are geographically separated. If satellite technology is used for the teleconference, then, there is no limit to the number of sites that can be linked through the combination of several communications satellites. In order to participate in a teleconference, participants usually have to assemble at a specific site in order to use the special equipment that is necessary for a group to participate in the conference.

The only exceptions are audio teleconferences which can link up any individual who has access to a telephone, computer conferences that can link up individuals, their computers and modems at home, or direct broadcast satellites that can deliver information directly to participant's homes. However, if more than two people are present at a participating site then it is necessary for the participants to gather at a location which is equipped with teleconferencing equipment in order to participate in a teleconference.

This may restrict access for some learners. In terms of control, participants will have control over the interaction that takes place in a teleconference only

to the extent that the instructional design allows for it. However, if the teleconference is taped for later review, students will have more control in the use of the conference. The unique advantage of teleconferences is that they provide for two-way interaction between the originators and the participants. Teleconferences need to be designed to optimize the interaction that takes place during the conference. Interaction needs to be thought of not only as interaction that occurs during the teleconference but pre-and post conference activities that allow groups to interact. Monson (1978) describes four design components for teleconferences: humanizing, participation, message style and feedback. Humanizing is the process of creating an atmosphere which focuses on the importance of the individual and overcomes distance by generating group rapport. Participation is the process of getting beyond the technology by providing opportunities for the spontaneous interaction between participants. Message style is presenting what is to be said in such a way that it will be received, understood and remembered. Feedback is the process of getting information about the message which helps the instructor and the participants complete the communications loop. Monson (1978) offers excellent guidelines for incorporating these four elements into teleconferencing design. The symbolic characteristics and the interfaces that are unique to each medium are discussed with the description of each technology.

Audio Teleconferencing. Audio teleconferencing or audioconferencing is voice-only communication. Even though it lacks a visual dimension, audio teleconferencing has some major strengths: It uses the regular telephone system, which is readily available and a familiar technology; it can connect a large number of locations for a conference; the conferences can be set up at short notice; and it is relatively inexpensive to use when compared with other technologies.

The interconnection medium for an audio teleconference is usually the telephone, which can incorporate microwave, satellite, fibre optic, or coaxial cable transmission. The conference call between three or more persons at different locations is the simplest type of audio teleconferencing. For multipoint teleconferencing among three or more sites, an audio bridge is required to enable sites to interact clearly. The bridge links the telephone lines together so that parties at each location can hear and talk to each other. Olgren and Parker (1983) observe that there are many system options for audio teleconferencing, but the most common forms are: (1) user-initiated conference calls or ("ad lib" teleconferencing), (2) operator-initiated or dial-up or (dial-out) teleconferencing, (3) dial-in or meet-me teleconferencing, and (4) dedicated audio networks. In order to facilitate group-to-group communication, audio teleconferencing requires the use of some type of amplified telephone equipment with a loudspeaker and microphones. The equipment may be built into the room or may be portable. Audio teleconferencing equipment can be described as simplex, quasi-duplex, or full-duplex, depending on the kind of interactivity and interruptibility of the conference connection.

Olgren and Parker (1983) observe that one should keep in mind that voice communication is the backbone of any teleconferencing system, with the exception of computer conferencing. Sophisticated video or graphics equipment can be added to any audio system. But it is the audio channel that is the primary mode of communication. If the audio is of poor quality, it will have a negative impact on users of even the most sophisticated graphics and video technologies. This is very important to keep in mind, because the evaluation of interactive television systems have shown (Dillon, Gunawardena & Parker, 1992) that the most often cited technical problem in television systems is the poor audio quality. While expensive investments have been made in video and graphics systems, very little attention has been paid to the improvement of audio quality in video and audiographics conferencing systems.

Audio teleconferences can be enhanced by adding a visual component to the conference by mailing ahead of time printed graphics, transparencies, or a videocassette to be used during the conference. Each site must be equipped with an overhead projector and a VCR if such graphical or video support is used.

Audiographics Conferencing. Audiographics systems use ordinary telephone lines for two-way voice communication and the transmission of graphics and written material. Audiographics add a visual element to audio teleconferencing while maintaining the flexibility and economy of using telephone lines. Audio teleconferencing is now combined with written, print, graphics, and still or full-motion video information. Most audiographics systems use two telephone lines, one for audio and one for the transmission of written, graphic, and video information.

Currently, the simplest audiographics system is the addition of a fax machine using a second telephone line to an audio teleconference. Printed information can be exchanged during the conference using the fax machine so that visuals can be shared between sites. As a result of recent developments in computer, digital, and video compression technology, fairly sophisticated computer-based audiographics systems are available in the market. These systems combine voice, data, graphics, and digitized still video to create a powerful communications medium.

The PC-based systems have specially designed communications software that control a scanner: graphics tablet, pen, and key board; and video camera, printer, and a modem. One of the key advantages of an audiographics system is the ability to use the screen-sharing feature of the system. Participants at different sites can use different coloured pens to create a graphic on the same screen at the same time.

This feature enables the use of collaborative learning methods that involve learners at the remote locations. Since each site is most often equipped with the same types of equipment, it is possible to originate instruction from any location. The systems allow for a higher degree of interaction than one-way video and two-way audio systems. If the system is equipped with a video camera, it is

possible to bring video footage to the class or show three-dimensional objects. High-resolution, full-colour still video images can quickly be transmitted through dial-up telephone lines. Some systems have incorporated a keypad device that is used for polling participant's opinions and feedback. When the instructor asks a multiple-choice question, participants can use the keypad to key in their response. A central computer tabulates these responses, and the instructor gets an instantaneous statistical summary of the entire group's responses, as well as how each site responded. This is a good way of soliciting and getting feedback from the participants, so that the instructor can adjust his or her presentation depending on the responses received.

Because audiographics systems use regular telephone lines, they are much more cost effective than full-motion video systems. Participants need to be present at locations equipped with the systems in order to participate in a conference, and this may be inconvenient to some learners.

The systems enable the transmission of audio, graphics, data, and still-video information and create a moderate sense of social presence. 'Me human-interface depends to a large degree on the type of communications software that has been designed for the system. Most graphic systems can be mastered by novices with about I hour's training on the system.

Video Teleconferencing. Video teleconferencing systems transmit voice, graphics, and images of people. They have the advantage of being able to show an image of the speaker, three-dimensional objects, motion, and preproduced video footage. The teleconference can be designed to take advantage of the three symbolic characteristics of the medium: iconic, digital, and analog, where the iconic or the visual properties of the medium which is television's foremost strength can be manipulated to convey a very convincing message. Because of its ability to show the images of people, video teleconferences can create a "social presence" that closely approximates face-to-face interaction. Video teleconferencing systems are fully interactive systems that either allow for two-way video and audio, where the presenters and the audience can see and hear each other, or one-way video and two-way audio, where the audience sees and hears the presenter, and the presenter hears only the audience. During a video teleconference, audio, video, and data signals are transmitted to distant sites using a single combined channel, as in the use of a fiberoptic line or on separate channels. Audio is most often transmitted over a dial-up telephone line. The transmission channel can be analog or digital; signals can be sent via satellite, microwave, fibre optics, or coaxial cable, or a combination of these delivery systems.

The term video teleconferencing has become popular as an ad hoc one-time, special-event conference that usually connects a vast number of sites in order to make the conference cost effective. A video teleconference is usually distinguished from interactive instructional television (ITV), which is generally used to extend the campus classroom and carries programming for a significant length of time, such as a semester. ITV may use the same transmission channels

as a video teleconference but is distinguished from video teleconferencing because of its different applications: video teleconferencing, an ad hoc conference, and ITV extending the classroom over a longer period of time.

Video teleconferences can be classified into two broad areas according to the technology used for transmission: full-motion video teleconferencing or compressed (or near-motion) video teleconferencing. Full-motion video teleconferencing uses the normal TV broadcast method or an analog video channel that requires a wideband channel to transmit pictures. The range of frequencies needed to reproduce a high-quality motion TV signal is at least 4.2 million Hz (4.2 MHz). The cost of a full-motion video teleconference is therefore extremely high. In the 1970s, conversion of the analog video signal to a digital bit stream enabled the first significant reductions in video signal bandwidth, making video conferencing less cost prohibitive. Therefore, in compressed-video, full video information is compressed by a piece of technology known as a Codec, in order to send it down the narrower bandwidth of a special telephone line. The compressed video method is cheaper and more flexible than the TV broadcast method.

Full-Motion Video Teleconferencing. Full motion video teleconferencing became popular with the advent of satellite technology. For the past decade, educational developers have provided credit courses via satellite television over networks such as the National Technological University (for graduate engineering course), the Arts & Sciences Teleconferencing Service at Oklahoma State University, the TI-IN Network in Texas (for advanced placement high school courses). Both remote and urban schools and businesses have found these educational services valuable enough for their students and employees to make the investment in satellite hardware and tuition fees. Standard C-or Ku-band satellite TV signals can be received by consumer-level hardware costing well under $2,000. For a producer of educational programming, satellite delivery is still more economical than any other format for point-to-multipoint video transmission. Video compression standards and the introduction of fiber-optic cable infrastructure by many telephone and cable companies promises to make terrestrial line transmission of video much cheaper in the near future.

There are, however, at least two reasons that satellite television will probably remain available and, in fact, increase in the foreseeable future. First, there are still many remote areas of the world, even in North America, where telephone service, if it exists at all, is supported by antiquated technology barely able to provide a usable audio or data signal, let alone carry video. These remote areas simply need to point a relatively inexpensive satellite dish powered by solar panels, batteries, or generators-at the appropriate satellite to receive its signal. Additionally, new higher-powered satellites are making it unnecessary to use today's large unwieldy satellite dishes. The new generation of Ku-band satellite is already offering direct broadcast service (DBS) to European households. These receivers, known as VSATs (or very small aperture terminals), are no larger than I to 3 feet in diameter and currently cost less than $500.

The proliferation of smaller, less-expensive satellite television reception technology, along with the continued launching of new, higher-powered satellites, will ensure a continuing niche for this technology to deliver instructional video and data to even the remotest areas of the world that lack other information infrastructure.

Fibre optics is gaining in popularity as a transmission medium for video teleconferencing. Fibre optics is a transmission technology using an attenuated glass fibre hardly thicker than a human hair, which conducts light from a laser source. A single glass fibre can carry the equivalent of 100 channels of television or 100,000 telephone calls, and even more capacity is possible by encasing many fibers within a cable. Fibre optics offers several advantages: It can carry a tremendous amount of data at high transmission speeds; it does not experience signal degradation over distance as does coaxial cable; and it is a multipurpose system that can transmit video, audio, data, and graphics into the school through a single cable. A single fiber-optic cable can carry over a billion bits per second, enabling several video teleconferences to run simultaneously. Many companies, universities, and states in the United States are building fiber-optic transmission networks to carry voice, data, and video.

Video teleconferencing can also use digital or analog microwave systems or dial-up digital transmission lines. Current developments centre on converging the different transmission channels and using a combination of telecommunications channels, satellites, fibre optics, microwaves, and coaxial cables to deliver full-motion video teleconferencing.

Compressed Video Teleconferencing. Videocompression techniques have greatly reduced the amount of data needed to describe a video picture, and have enabled the video signal to be transmitted at a lower and less expensive data rate. The device used to digitize and compress an analog video signal is called a video codec, short for COder/DEcoder, which is the opposite of a modem (MOdulator/DEModulator). Reduction of transmission rate means trade-offs in picture quality. As the transmission rate is reduced, less data can be sent to describe picture changes. Lower data rates yield less resolution and less ability to handle motion. Therefore, if an image moves quickly, the motion will "streak" or "jerk" on the screen.

Currently most compressed video systems use either T-I or half a T-I channel. In a T-I channel, video is compressed at 1.536 Mbps, which is the digital equivalent of 24 voicegrade lines. Many users of T-I codecs opt for transmission at 768 kbps, which is half a T-I channel. The difference in video quality between transmission at 768 kbps and 1.536 Mbps is slight, but the cost savings are significant. With the proliferation of fiber-optic networks, some private video teleconferencing networks are taking advantage of high-quality 45 Mbps transmission. Digital video compression technology has allowed video teleconferencing to become less cost prohibitive. It is not as cost effective as audio teleconferencing and audiographics teleconferencing, but it may soon compete with more-sophisticated audiographics systems with future developments in video compression technology.

Desktop Video Teleconferencing. Future developments in video teleconferencing will move towards integrated desktop video teleconferencing combining audio, video, and data. A fusion of network, personal computer, and digital video has produced the field of desktop videoconferencing. Saba (1993) observes that several telecommunications companies have introduced integrated systems (voice, video, and data) that reside in a desktop computer and provide two-way synchronous communications with voice, image, and file-transfer and screen-share capabilities. This technology allows users to see each other, speak to each other, transfer application files, and work together on such files at a distance. Most systems do not require advanced digital communications technologies such as ISDN to operate. For those wanting to utilize ISDN, it is possible to purchase an ISDN card, while most systems are now being designed to work with telecommunications standards such as ISDN.

Education can use this technology as a method of presenting class material and forming work groups, even though they may be at a considerable distance from each other. An instructor could conceivably present material to the entire class either "live" or through delivery of an audio file to each student's electronic mail account. Students could then work together in real time if they wished to share information over telephone lines.

In one current example, German officials are making use of desktop videoconferencing to form what has been dubbed a "virtual government." As planing progresses to move offices from Bonn, the current capital, to Berlin, planners meet regularly using on-line workstations rather than traveling to meetings. The results provide faster interaction at a much lower cost. As more technologies begin to dovetail, desktop videoconferencing becomes laptop videoconferencing. The use of cellular telephone technology combined with high-speed laptop modems will make it possible for people to hold meetings and work group sessions whether they are at home, in an office, or on the beach.

Interactive Instructional Television (ITV). Interactive instructional television (ITV) systems usually use a combination of "instructional television fixed service" (ITFS) and point-to-point microwave. They can transmit either two-way video and two-way audio, or one-way video and two-way audio, to several distant locations. The advantage of combining ITFS and microwave is that microwave is a point-to-point system, while ITFS is a point-to-multipoint system. Therefore, large geographical areas can be covered by the combination of the two technologies. Microwave connects one location to another electronically with its point-to-point signals, while ITFS distributes that signal to several receiving stations around a 20-mile radius. In the U.S., several states such as Iowa and Oklahoma support statewide networks that use a combination of ITFS, raicrowave, satellite, fibre optics, and coaxial cable.

In an ITFS and microwave television system, the course delivered over the system originates from a "studio classroom" on the campus. The classroom is specially designed to facilitate the extension of a conventional class through television. The audio feedback permits interaction between the teacher and

students at distant locations. If a student viewing the class at a remote location has a question, he or she asks it through a talkback system, and it is heard by both on-campus and off-campus class members. The talkback system uses either the telephone or FM microwave technology, called radio talkback.

Interactive instructional television systems also use satellite, fibre optics, or compressed video to extend the traditional classroom. However, these systems are currently not as cost effective as systems that comprise of ITFS and point-to-point microwave.

Integrated Services Digital Network (ISDN).ISDN is a new international telecommunications standard that offers a future worldwide network capable of transmitting voice, data, video, and graphics in digital form over standard telephone lines or fibre optic cable. ISDN transmits media using digital rather than analog signals. In order to move towards a global network, ISDN promises end-to-end digital connectivity, multiple services over the same transmission path and standard interfaces or conversion facilities for ubiquitous or transparent user access. Saba (1988) points out ISDN's applications for distance education: convergence, multitasking and shared communications. Convergence refers to the convergence on audio, video and data media in an integrated telecommunication system. Instruction is possible through voice, data, graphics, and video images. Multitasking refers to the variety of telecomputing capabilities that are available to the learner through integrated telecommunication systems that are based on minicomputers or microcomputers. Learners can gain access to online databases worldwide, and explore multimedia libraries comprising of digital sound, text and images. The shared communications feature allows the teacher and a group of learners separated by distance to work interactively on the same screen, sharing graphics, text, or data at the same time. Therefore, it is possible to solve a problem together or draw a graphic together even though a group of learners may be at different geographic locations. Currently available audiographics systems and desktop video teleconferencing systems provide for the features that will be available in a more user friendly and cost effective manner with the development of ISDN systems.

Broadcast Television and Radio. Broadcast television and radio fall under the classification of same-time/different-place instruction. The difference between broadcast television and radio and the previously discussed technologies under the same category is that broadcast television and radio do not provide for real-time, two-way interaction between presenters and participants. These media, however, can be used to instruct a vast number of students at the same time, even though the students do not have the ability to call back and clarify a statement or ask a question in real time. Many distance education institutions in developing countries, as well as institutions in developed countries such as the British Open University, use broadcast television and radio extensively to deliver programming to a large number of distant learners.

In the United States, while television-both open broadcast cable and ITV-is the most popular media for delivering distance education, radio remains an

underutilized medium (Gunawardena, 1988). It is in the developing countries that radio programming has been produced to either support and supplement print-based materials or to carry the majority of the course content.

In the United States, the most common pattern of open broadcast use for delivering distance education is for an institution to make arrangements with the Public Broadcasting Service (PBS) and/or a commercial television station to distribute the educational programming. One of the limitations of this type of distribution is that educational programming is confined to broadcast schedules predetermined by the broadcasting station, which may not be times convenient for students taking the course.

Bates (1984) observes that broadcasts are ephemeral, cannot be reviewed, are uninterruptable, and are presented at the same pace for all students. A student cannot reflect on an idea or pursue a line of thought during a fast-paced programme without losing the thread of the programme itself. A student cannot go over the same material several times until it is understood.

Therefore, it is difficult for the learner to integrate or relate broadcast material to other learning. Hence, the need for broadcast programming to be accompanied by support materials in the form of prebroadcast notes and follow-up exercises and activities. Research at the British Open University has indicated that "most students find it impossible to take notes while viewing, and those that do are usually very dissatisfied with their notes" (Bates, 1983, p. 61). Access to a videotape of the broadcast, however, will alleviate these problems by giving the learner control over the medium, with the ability to stop and rewind sections that were not clear.

Despite its ability to reach a large section of the student population, open-broadcast television is a one-way communication medium. It does not provide for interaction,(two-way communication) between the student and the teacher and lacks flexibility and ability to respond to student feedback. Since students cannot question the instructor to clarify problems, and since professional broadcast production "makes the learner dependent on 'responsible' broadcasting" (Bates, 1983, p. 61), this system of distribution can encourage passive acceptance of the instruction. To make the system interactive, open-broadcast distribution requires an added system to provide either an audio or audio-video return circuit.

Cable Television. In the United States, cable television began in remote rural areas, expanded into the suburbs, and has now penetrated into large urban areas. Cable has evolved from a way of improving reception in rural areas to a technology capable of providing many channels and even two-way video communication.

Microwave relays have enabled cable operators to pick up signals from television stations too distant to be picked up over the air. Satellite interconnection of cable systems makes possible the importation of programming from virtually any part of the world. Today, cable technology is readily available and reaches a large number of homes and apartment units in the United States.

Where cable can provide access to a large section of the population of a given geographic area, it can be used to distribute distance education. Cable can be used to replay Programming offered over open-broadcast television, usually at more convenient times for the students than open-broadcast schedules, or used as a means of delivering nationally distributed television programmes, where terrestrial broadcasting facilities are not available.

Interactive cable in most cases is not two-way video. It is one-way video with telephone feedback from the viewer to the instructor, or a technology that provides viewers with one-way video and one-way audio feedback combined with keypads or polling devices with which they can transmit impulses to a central computer in response to questions posed by the instructor. Student responses, such as "yes," "no," "do not understand," "slow down," *etc.,* are immediately summarized by a central computer for the instructor, and often for the viewing audience, thereby adding an element of interaction to the experience.

Different Time/Same Place Instruction

This type of instruction usually takes place in a lab or study centre where distance learners gather at different times to interact with instructors, tutors, and other students. Certain types of instructional objectives can only be successfully met by arranging for learners to conduct an experiment in a lab and observing this experiment for evaluation purposes. Local study centers are used by major distance teaching universities such as the British Open University to support the distance learner by offering meetings with tutors, discussion with peer groups, and library facilities. A survey of distance teaching institutions in the United States (Gunawardena, 1988) found that only 41% of the total number of institutions surveyed used local study centers. The types of services provided by most of the institutions were student access to media equipment such as videocassette players and microcomputers, and library facilities such as books, tapes, and cassettes, rather than arrangements for tutor-student interaction.

Different Time/Different Place Instruction

The technologies used in this category are further classified as those that transmit one-way information such as print, audio-and videocassettes, and those that provide for interaction. Technologies that provide for interaction are divided into two groups: (1) those that permit interaction between the instructor and the learner, and among groups of learners such as computer-mediated communication those that provide learner-machine interaction as in computer-assisted instruction (CAI)/ computer-based training (CBT) and interactive video and videotex. CAI/CBT, interactive video., and videotex are highly individualized learning experiences that can be designed to give learners control over their learning. Since the technologies that provide learner-machine interaction are discussed elsewhere in this book, they will not be discussed in this chapter.

Print. Until the beginning of the 1970s and the advent of two-way telecommunications technologies, print and the mail system were the

predominant delivery medium for distance education. Correspondence study relied primarily on print. to mediate the communication between the instructor and the learner. Currently, many distance education institutions in developing countries use print-based correspondence study as the main distance education medium, as the use of communications technologies is often cost prohibitive. Garrison (1990) refers to print-based correspondence study as the first generation of distance education technology. It is characterized by the mass production of educational materials, and Peters (1983) describes it as an industrial form of education. The difficulty with correspondence education has been the infrequent and inefficient form of communication between the instructor and the students. Also, it was difficult to arrange for peer interaction in correspondence-based distance education. The development of broadcast technologies and two-way interactive media have mitigated the limitations of correspondence study, especially in relation to facilitating two-way communication. However, print remains a very important support medium for electronically delivered distance education. Printed study guides have become a very important component of electronic distance education. In a survey of distance teaching institutions in the United States that use television as a main delivery medium, Gunawardena (1988) found that a majority of institutions cited the study guide, which provides printed lesson materials and guidelines for studying, the most important form of support for distance learners. A study guide can steer and facilitate the study of correspondence texts, television programmes, and other components in a distance education course. A study guide, if well designed, can provide the integration between various media components and activate students to read and or listen to presentations of various kinds, to compare and criticize them, and to try to come to conclusions of their own. In a study guide or correspondence text, simulated conversation can be brought about by the use of a conversational tone, advance organizers, mathemagenic devices such as directions, and underlining, self-assessment, and self remediation exercises.

Audiocassettes. Audiocassettes afford the learner control over the learning material, because learners can stop, rewind, and fast-forward the tape. They offer great flexibility in the way they can be used, either at home or while driving a car. Since audiocassettes are a fairly cost-effective medium, they are easily accessible to students. Audiocassettes can be used to tape lectures or can be specially designed with clear stopping points in order to supplement print or video material. For example, in order to facilitate student learning, audiocassettes can be used to describe diagrams and abstract concepts that students encounter in texts. An audiocassette can be used to record the sound portion of a television programme if a videocassette recorder is not available, and an audiocassette can provide a review of a television programme in order to assist students to analyse the video material. The audiocassette can also be used to provide feedback to student assignments and is a very useful medium to check student pronunciation when languages are being taught at a distance. Audiocassettes can be an excellent supplementary medium to enrich print or other media and

can provide resource material to distance learners. Since they can be produced and distributed without much cost, audiocassettes are also a very cost-effective medium for use in distance education.

Videocassettes. Videocassettes are like broadcast television in that they combine moving pictures and sound, but unlike broadcast television, videocassettes are distributed differently and viewed in different ways. An institution using videocassettes for distribution of video material to distant learners can use them as (a) a copy technology for open-broadcast, satellite, or cablecast programming; (b) a supplementary medium, for instance, providing the visual component for educational material carried over audio teleconferencing networks; (c) a specially designed video programme that takes advantage of the cassette medium, *e.g.*, its stop/review functions, so that students can be directed at the end of sequences to stop and take notes on, or discuss, what they have seen and heard.

An important advantage in using videocassettes is that students can exercise "control" over the programming by using the stop, rewind, replay, and fast-forward features to proceed at their own pace. Videocassettes are also a very flexible medium allowing students to use the cassettes at a time that is suitable to them. Bates (1987) observed that the "videocassette is to the broadcast what the book is to the lecture".

If videocassettes are designed to take advantage of their "control" characteristics and students are encouraged to use the "control" characteristics, then there is opportunity for students to interact with the lesson material. Students can repeat the material until they gain mastery of it by reflecting on and analyzing it. The control features that videocassettes afford the learner give course designers the ability to integrate video material more closely with other learning materials, so that learners can move between lesson material supplied by different media. "The ability to create 'chunks' of learning material, or to edit and reconstruct video material, can help develop a more-questioning approach to the presentation of video material. Recorded television therefore considerably increases the control of the learner (and the teacher) over the way video material can be used for learning purposes".

Bates (1987) discusses the implications of the "control" characteristics for programme design on videocassettes: (a) use of segments, (b) clear stopping points, (c) use of activities, (d) indexing, (e) close integration with other media (*e.g.*, text, discussion), and (f) concentration on audiovisual aspects. When videocassettes are used in a tutored video instruction (TVI) programme, where tutors attend video-playback sessions at workplaces or study centers to answer questions and to encourage student discussion, students can take advantage of the features of a lecture (on videocassette) and a small-group discussion, which gives them the opportunity for personal interaction available in on-campus instruction.

Computer-Mediated Communication (CMC). CMC supports three types of on-line services: electronic mail (e-mail), computer conferencing, and on-line

databases. In e-mail systems, a message is routed by the system to the addressee's mailbox on the host computer and remains there until it is read by the addressee. This message can be read, replied to, left in the mailbox for later perusal, saved to the hard disk on the microcomputer, deleted, or forwarded to someone else. Most e-mail systems have a bulletin board feature that allows users to read and post messages and documents to be seen by all. However, the messages in the bulletin board system are not linked to each other and provide for only a very limited form of group communication.

Computer conferencing systems, on the other hand, provide a conferencing feature in addition to e-mail, which supports group and many-to-many communication. In these systems, messages are linked to form chains of communication, and these messages are stored on the host computer until an individual logs on to read and reply to messages. Most conferencing systems offer a range of facilities for enhancing group communication and information retrieval. These include directories of users and conferences, conference management tools, search facilities, polling options, cooperative authoring, the ability to customize the system with special commands for particular groups, and access to databases. Databases can be made available on the same host computer used for an e-mail or computer conferencing system, or users can access public or private databases resident on other computers. Some of the well-known computer conferencing systems are: EIES, PARTI, CAUCUS, CONFER, COSY, VAX NOTES, and TEAMATE. Recent developments in groupware, the design of software that facilitates group processes especially in the CMC environment, will have a tremendous impact on facilitating group work between participants who are separated in time and place.

The key features of computer conferencing systems that have an impact on distance education are the ability to support many-to-many interactive communication and the asynchronous (time-independent) and place-independent features. It offers the flexibility of assembling groups at times and places convenient to participants. The disadvantage, however, is that since on-line groups depend on text-based communication, they lack the benefit of nonverbal cues at facilitate interaction in a face-to-face meeting. Levinson (1990) notes that research into education via computer conferencing must be sensitive to the ways in which subtle differences in the technology can impact the social educational environment. "The importance of social factors suggests that 'computer conferencing' may be a better name for the process than is 'computer-mediated communication'; the term 'conferencing' accentuates the inherent 'groupness' of this educational medium" (p. 7). Harasim (1989) emphasizes the necessity to approach on-line education as a distinct and unique domain. "The group nature of computer conferencing may be the most fundamental or critical component underpinning theory building and the design and implementation of on-line educational activities". Gunawardena (1993) reviews research related to the essentially group or socially interactive nature of computer conferences, focusing on factors that impact collaborative learning and group dynamics.

Globaled, a project that linked graduate classes in six universities-San Diego State University, Texas A&M University, University of New Mexico, University of Oklahoma, University of Wisconsin-Madison, and the University of Wyoming-to engage in the discussion of research related to distance education, is an example of the potential of computer conferencing to link students and instructors in learning communities (Gunawardena, Campbell Gibson, Cochenour, Dean, Dillon, Hessmiller et a]., 1994). While the six major participating universities conducted research projects and moderated the discussions of their findings on Globaled, several interested students and faculty from other U.S., and overseas universities, including the Pennsylvania State University and the University of Wollongong in Australia, participated in the discussions. The Globaled community had approximately 90 participants. Globaled was premised on a learner-centred collaborative learning model in which the learner would be an active participant in the learning process involved in constructing knowledge through a process of interaction and discussion with learning peers and instructors.

2

Competencies for Online Teaching and Learning

Information technology is changing the way people live and learn. Not surprisingly information technology is also transformation the nature of teaching. These remarks provide a framework for thinking about such changes and exploring work in progress that is relevant to the development of competencies specific to teaching online.

COMPETENCE, COMPETENCIES AND CERTIFICATION

Competence refers to a state of being well qualified to perform an activity, task or job function. When a person is competent to do something, he or she has achieved a state of competence that is recognizable and verifiable to a particular community of practitioners. A competency, then, refers to the way that a state of competence can be demonstrated to the relevant community. The International Board of Standards for Training, Performance and Instruction, a competency involves a related set of knowledge, skills and attitudes that enable a person to effectively perform the activities of a given occupation or function in such a way that meets or exceeds the standards expected in a particular profession or work setting. The structure and assessment of competencies may differ from one community of practice to another and even within a community. To facilitate a common understanding of competencies in the context of online and distributed learning some specifications have been elaborated. Typically, a competency is divided into specific indicators describing the requisite knowledge, skills, attitudes and context of performance. There are different ways to validate that

a person has demonstrated the relevant competencies. One of them is through a certification process. Teacher certification is a common practice, and the notion of teacher competencies is fairly well established. However, competencies are generally associated with highly formalized professional activities and not applied to ill-defined tasks. Ill-defined tasks certainly include many forms of teaching. This narrow view of competence runs counter to common sense and professional practice, but brings into attention the mainstream approach to elaboration of teacher competencies where it is essential to clearly identify the conditions of teaching. The delivery environment is a particularly relevant condition to identify competencies for online teaching.

ONLINE AND CLASSROOM TEACHING

Information technology can be integrated into both online and classroom settings, but the interaction between these technologies and new approaches to learning and instruction may vary. The range of activities available in online settings and the multiple conditions of time in which they take place are evidence that the technology demands placed on online teachers are somewhat more significant than those associated with classroom teachers.

Much of what has already been published with regard to online teaching has focused on technical skills and requirements of successfully moderating and facilitating online discussions and chat sessions. This body of literature suggests that becoming an effective online moderator requires training and that there are competencies unique to online environments. In online asynchronous discussions, the moderator's competencies involve allowing learners time for reflection, keeping discussions alive and on a productive path, and archiving and organizing discussions to be used in subsequent sessions.

In online synchronous discussions, the moderator must establish ground rules for discussion, animate interactions with minimal instructor intervention, sense how online text messages may appear to distant learners, and be aware of cultural differences. How are these competencies unique to online teaching?

At the applied level, animating discussions, displaying cultural sensitivity and so on, apply to all teachers. At the environment level, however, the ways in which a teacher demonstrates such competence is quite different, which suggests that there are competencies unique to online settings. Belisle and Linard the use of IT in teaching calls for additional competencies adapted to new roles and circumstances. Teaching competencies and online teaching competencies have generally been considered separately. However, efforts to interrelate the two are being undertaken by IBSTPI in association with the research centre for Télé-université, Université de Québec.

IMPLICATIONS OF COMPETENCIES FOR ONLINE TEACHING

The current interest in competencies for online teaching is coming from business and industry, primarily with regard to technical training and professional development courses offered in online settings. It is quite likely that some of

the interest in competencies for online teaching is a result of hastily-crafted online courses and inadequate preparation of online facilitators.

Clearly technology offers the potential to create and implement highly engaging and effective online environments to support a wide variety of learning goals. It is also quite clear that our capacity to make effective use of information technology in educational settings is impaired by inadequate preparation of teachers and by a shortage of properly trained instructional designers and educational support personnel. The development of competencies for online teaching should lead to the associated development of training for online teachers and to the certification of online teachers.

To develop competencies for online teachers is not without challenge. Competencies are dynamic in nature, and they largely depend on the relevant social context. The constant transformation of IT makes the development of competencies for online teachers a continuous process and demands continuing professional preparation and training for online teachers. Such endeavors will improve our ability to make effective use of technology in learning and instruction.

QUALITY STANDARDS IN ONLINE TEACHING AND LEARNING

The challenges associated with online teaching and learning demand new approaches to quality assurance beyond the framework within which higher education institutions currently operate. As Taylor and Richardson assert, there is a need for quality assurance systems which consider "the standard of online information", and at the same time, support academics in the development of high quality online resources. This document presents an approach developed by the University of South Australia, which addresses both these aspects of quality - providing the standards by which online courses are judged, and supporting academics as they develop their own scholarship of teaching in the area of online learning. The Boyer notion of scholarship is a framework for considering academic work that can be applied to online teaching and learning within universities.

Boyer identified four scholarships - discovery, teaching and learning, integration and application. His approach is predicated on an understanding of the communal basis of all scholarly activity: that scholarship by its very nature is a public rather than private activity; that it is open to critique and evaluation by others; and that a field of study is progressed through the scholarly activity of building new ideas which are then open to the same processes of public scrutiny. All of the scholarships are exposed to the same rigorous approaches of peer review as a way of gaining quality, transparency and accountability. Within this framework the scholarship of teaching and learning has emerged as a major theme in the higher education sector. Central to this notion of the scholarship of teaching and learning is that of the 'learning community' - the recognition of the value of relationships and practices that occur in and through the work

practices of staff. One way to support and stimulate this kind of collegial activity is to provide structured opportunities for discussion and reflection through a checklist of agreed good practice.

Taylor and Richardson advocate the application of this approach to the design and construction of information and communication technology based teaching resources, arguing that independent peer review requires "...the development of an explicit and shared understanding of the scholarship underlying the design and development of these resources". Such shared understanding, just as to Taylor and Richardson can also form the basis for validating the quality of the resources. This document describes the development of a checklist and supporting website, in which shared understanding about the scholarship of teaching and learning in resources developed for online delivery is made explicit.

The principles underlying the development of this approach are as follows:

- The criteria for the standards of development have been gathered from the full range of relevant academic literature surrounding online teaching and learning. This affirms the work of academics in the area and provides it in a highly practical form which is accessible to a broadly-based audience.
- The approach locates responsibility for the quality of teaching and learning with the academic staff responsible. Staff can use the items to guide the development or redevelopment of their own courses through reflective processes.
- The instrument and its associated website provide an opportunity for just-in-time academic staff development by providing the accepted standards, information about how to meet these and examples of how others have done this.
- The instrument provides a framework to involve other academics in the process of peer review.
- The website is designed to provide a model of best practice, and has been validated using the W3C Mark-up Validation Service, and the W3C CSS Validation service, and complies with W3C Web Content Accessibility Guidelines 1.0.

REVIEW OF OTHER INSTRUMENTS

In order to pursue this approach, the authors reviewed a range of instruments available through the Internet. Several generic descriptors for online course development and evaluation were identified. Since online teaching and learning is still a developing area of academic activity within universities, and many staff engaged in online approaches have limited expertise, the authors were interested in identifying instruments that provided an educative and explanatory dimension which supported the evaluative function. In effect, this required the

instrument to be both comprehensive in scope and specific in detail. A review of the instruments available identified several problematic issues. First, several had been developed to address particular aspects of course development and were partial in their scope rather than comprehensive.

Second, many of them were very general, open-ended instruments. Although there may be some justification for this in terms of providing a generic framework, these instruments make considerable assumptions about the level of expertise of those involved in the processes of online teaching and learning.

Third, some instruments were found to be comprehensive in their scope, but unnecessarily complex because the instrument and supporting online materials were not integrated. Finally, most of the online instruments were found to be inaccessible for users with disabilities. The authors noted features in some approaches that were consistent with the objectives of the proposed checklist of agreed good practice. Of particular note is the Michigan Virtual University's Standards for Quality Online Courses and the accompanying Excel-based Course Evaluator tool.

The standards addressed in the MVU instrument include several criteria proposed for a checklist of agreed good practice including; instructional design, accessibility, usability and technology. However, the authors were concerned about the complexity of this instrument, and in particular, the lack of a seamless integration between the Excel tool and the supporting online material. Furthermore, the authors contend that aspects relating to accessibility and usability need to be embedded within criteria relating to instructional design, interface design, use of media and technological issues, rather than treated as separate considerations.

DESIGN AND DEVELOPMENT

Since the instruments reviewed failed to adequately address all of the needs that the authors had identified as important characteristics of a checklist of agreed good practice, it was necessary to develop a new review tool designed to meet those needs. In doing so, the authors recognized the need to build on the experience gained from the review process which had indicated some consistency in the priority placed on certain criteria. For example, Michigan Virtual University's standards for quality online courses, the peer review proforma developed by the Griffith Institute for Higher Education, the Electronic Learning Institute's criteria and standards used in evaluating Web-based instruction and delivery guidelines, and Lyn Knowitall's expert review checklist all consider instructional design issues, interface design and/or appropriate use of media and technological issues.

The proactive evaluation model proposed by Sims also places importance on criteria relating to instructional design, interface design and elements of content utility, including the accessibility of the content. Similarly, the MVU standards consider accessibility issues, using the W3C Web Content Accessibility Guidelines 1.0 Priority 1 criteria as its benchmark. This review of the literature

and available evaluation approaches informed the authors' decision to structure the review tool and associated website around the following areas of consideration:

- Instructional design
- Interface design
- The use of multimedia to engage learners
- The technical aspects of interactive educational multimedia.

The authors opted to embed criteria relating to inclusivity in items associated with all four areas of consideration, since issues such as accessibility impact on the instructional design, usabilitity, use of media and technical functionality of online course materials.

The review of instruments also identified a range of different approaches employed to measure the extent to which the various items listed under these major areas of consideration meet the stated criteria.

These approaches include the complex quantitative rating system delivered via an Excel spreadsheet in the MVU's evaluator, simple yes/no checklist formats utilised in Electronic Learning Institute's criteria and standards used in evaluating Web-based instruction and delivery guidelines, open-ended qualitative questionnaire formats employed in the Southern Regional Education Board's criteria for evaluating Web sites, and the CIDOC Multimedia Working Group's multimedia evaluation criteria, and quantitave measures using a rating scale approach with provision for qualitiative responses to open-ended questions, as exemplified in the Griffith Institute for Higher Education's peer review proforma. Based on this analysis, the authors decided to adopt a combined approach, employing a 5-point Likert scale to and a free form text area for comments.

This approach was considered to be appropriate for the design and development of a checklist of agreed good practice, since a combination of quantitative and qualitative measures will most likely yield comprehensive results. In developing this tool, the authors acknowledge that such instruments have inherent limitations, since as Owston observed "....no single model or framework is likely going to satisfactorily capture the complexity of pedagogical, technical, organizational, and institutional issues inherent with Web-based learning".

However, the tool is not intended to be used in isolation from other academic practices. It will be most valuable when it is part of a wider framework of course and programme development and evaluation or established peer review processes. To a very significant extent the intention of the review tool is to generate scholarly discourse around online teaching and learning within the rich environment of an academic community.

Summative and formative evaluation has been an integral aspect of the development of the review tool from the point where the authors identified the need to develop an instrument within their own institution. This involved reviewing a range of instruments which were deemed inadequate for the purpose and audience.

After much research, a paper version was developed and circulated to a reference group of online enthusiasts and other interested staff. Feedback was incorporated into a revised version. Using this version, the course materials of a volunteer academic were reviewed and the results were presented to a seminar of staff involved in online teaching and learning. Further revisions were made and a beta version developed. In the next stage of the evaluation, academic staff, professional development staff and students at the University of South Australia will be invited to take part in a trial using the beta version and their feedback incorporated in the final version of the review tool and the online website.

DESCRIPTION OF THE REVIEW TOOL

The preceding part describes the design and development of a review tool comprising a paper-based checklist of agreed good practice and supporting website which provides an educative function, addresses issues relating to inclusivity, and is constructed around four main areas of focus - instructional design, interface design, use of media and technical aspects.

Educative Function

The educative dimension is central to both the just-in-time approach to professional development and approaches which involve more formal educational development. The associated website supports this educative function through the inclusion of features such as hyperlinks to explanations and the relevant literature that are accessed by selecting a "more" link alongside each checklist item, an exemplars part, and additional resources. There is often confusion among reviewers about the difference between general statements about the overall goals and clearly specified objectives. By selecting the "more" link the reviewer can check their understanding of these terms and also learn more about effective techniques for specifying objectives or learning outcomes from the hyperlink references included in the related explanatory screen.

Inclusivity

Items relating to inclusivity such as gender, culture and accessibility have been embedded across the four parts of the instrument. The decision to embed these items rather than to extract them into separate categories was based on the view that essentially the items reflect good teaching and ought to be seen in a more integrated way. Since the supporting website was designed to provide a model of good practice, it has been necessary to ensure that that it too meets W3C Web Content Accessibility Guidelines 1.0.

The accessibility design features incorporated into the design of the site are as follows:

- All pages validate at HTML 4.01 transitional using the W3C MarkUp Validation Service.
- Cascading style sheets are applied for layout and style, and have been validated using the W3C CSS Validation Service.

- Alt text attributes and captions have been applied to all visuals and image maps.
- Redundant text links are provided as footers on each page.
- Care has been taken to ensure that sufficient contrast is provided between foreground and background images, and that content does not rely on colour alone.
- The primary natural language of all Web pages has been specified.
- All tables linearise appropriately.
- Use of scripting languages and reliance on non-html languages has been avoided
- Links open as new pages rather than as new windows.
- All links can be accessed via keyboard control as well as mouse control.
- Menus are grouped logically and skip links are provided.

Areas of Focus

The review tool is constructed around four sets of considerations: instructional design, interface design, the use of multimedia to engage learners, and the technical aspects of interactive educational multimedia.

Instructional Design

Instructional design criteria consider how the strategies and techniques derived from learning theories are applied to the solution of instructional problems in interactive multimedia applications.

The importance of pedagogically driven instructional design in the creation of educational multimedia is well documented.

The features considered in instructional design criteria include:

- Whether the learning objectives are clearly stated;
- The appropriateness and accuracy of the content;
- The sequencing of instruction;
- Whether the topics are applied in "real" contexts;
- Assessment strategies and
- The appropriate use of feedback.

Interface Design

Interface design critieria address the quality of the end-user interface and how it affects "... users' perception of the product, what they can do with it and how completely it engages them". Reushle and Sonwalker contend that interface design and related usability factors will have a significant influence on the success of instructional interactive multimedia.

As Sonwalker explains, "Users interact with online Web courses through a graphical user interface, so the design of graphic elements, the colour scheme,

the type fonts, and navigational elements can all affect how a course is organized and perceived by students". Interface design criteria address all of these usability factors as well as accessibility criteria since as Dey advises "the interface needs to be accessible to as wide an audience as possible".

Use of Media

Effective use of media is a key aspect of educational design. This area of concern considers issues relating to the effective use of interactive multimedia, writing style and accuracy of text and copyright. The term interactive multimedia is used to identify the capacity of digital media to facilitate a range of interactive experiences; the aim being to promote active learner engagement. Evaluation of the appropriate use of of interactive multimedia considers the ways in which multimedia technologies are integrated into the teaching and learning process to support the learning objectives, promote learner control and "...actively engage learners in creation of knowledge that reflects their comprehension and conception of the information...".

Multimedia components such as animations, video and audio also present challenges for users who have disabilities, and those living in locations with restricted bandwidths. The criteria must therefore also consider accessibility features, such as the provision of synchronised captions to avoid precluding certain groups of students from engaging in the learning experience.

Technical Aspects

The technical aspects of interactive multimedia are considered in reviewing educational applications because software and hardware problems can undermine learners' confidence and their ability to form good models of how computers work. Accroding to Sonwalker, the issues influencing the technological success of online courses include available bandwidth, target system configuration, server capacity, browser software, and database connectivity. In addition to these factors, evaluation of the effectiveness of interactive multimedia applications in online education needs to consider the extent to which the course materials are accessible to all users across different platforms and browsers, if plug-ins are required whether the user is informed and links are provided, whether all hyperlinks are active and the overall robustness of the application.

STANDARDS FOR QUALITY ONLINE TEACHING

The most important factor affecting student learning is the teacher. Everyone understands, on a personal level, the importance of teachers to their educational success. Teachers who know their subject, understand how to teach and can adjust their teaching to student needs will be successful in raising student achievement, research shows. Teacher expectations also are a significant factor

in how much and how well students learn. Online learning provides the opportunity for every middle grades and high school student, regardless of where he or she lives or attends school, to have access to a quality teacher. Many of these students benefit by being challenged academically by an online teacher who, in some cases, possesses stronger academic credentials and essential teaching skills than traditional classroom staff, especially in certain geographic and subjectshortage areas.

Access to quality online teaching can result in improved student academic performance and increased course completion rates. Quality online teaching reflects the attributes of any effective teaching, whether in the traditional classroom or online. Both traditional classroom teachers and online teachers need to know their subjects and how to teach them. They also must know their students, stay up to date in their subject areas, and manage and monitor students' academic progress to ensure success.

But in the 10 years since Web-based courses were first made available to students, the understanding of what is required to be a successful online teacher has increased significantly. The technology used to access and provide Web-based courses effectively also has improved. Now it is important to re-examine what qualifications are needed to be an effective online teacher. Equally important is an understanding of the attributes of today's students, who have access to and can use technology to pursue opportunities and information never before available to them. For many students, this access has changed the way they see the world and the way they work and play. Consideration of these student issues is critical for a teacher to be effective.

Another often overlooked but important issue for online teachers: Delivery of Web-based courses is not restricted to a specific time or schedule. Because instruction does not start and stop at the same time for all students, time-management skills are extremely important, not only for the online teacher but also for students. The lack of these skills is a major reason why some students drop their online courses. Effective online teachers also must possess the ability to prepare quality written communications.

Appropriate and effective writing not only conveys information—it encourages and supports students. Words and body language that traditional classroom teachers use must be translated to the online environment for online teachers to be successful. All of these issues must be factored into setting appropriate standards for quality online teaching.

THE STANDARDS

The standards for quality online teaching in this report were developed by knowledgeable, experienced resource persons from K-12 and postsecondary education, drawn from national and regional organizations, SREB state departments of education, and colleges and universities.

Through extensive collaboration and sharing with SREB staff over many months, their work culminated in specific standards that SREB states can use to define and implement quality online teaching. Through broad acceptance of

these standards, SREB states will be able to provide more students with the courses they need, regardless of where students and teachers reside.

These standards have been supported by practice over time, as well as substantiated by research. In fact, research at both the K-12 and postsecondary levels is creating a growing body of evidence that quality online teaching is not only as good as traditional teaching—in many ways it can be superior

ACADEMIC PREPARATION

- *Standard*: The teacher meets the professional teaching standards established by a state licensing agency or the teacher has academic credentials in the field in which he or she is teaching.
- *Indicators*:
  - The teacher:
    a. Meets the state's professional teaching standards or has academic credentials in the field in which he or she is teaching;
    b. Provides evidence that he or she has credentials in the field of study to be taught;
    c. Knows the content of the subject to be taught and understands how to teach the content to students;
    d. Facilitates the construction of knowledge through an understanding of how students learn in specific subject areas; and
    e. Continues to update academic knowledge and skills.

SKILLS AND TEMPERAMENT FOR INSTRUCTIONAL TECHNOLOGY

- *Standard*: The teacher has the prerequisite technology skills to teach online.
- *Indicators*:
  - *The teacher*:
    a. Demonstrates the ability to effectively use word-processing, spreadsheet and presentation software;
    b. Demonstrates effective use of Internet browsers, e-mail applications and appropriate online etiquette;
    c. Demonstrates the ability to modify and add content and assessment, using an online Learning Management System;
    d. Incorporates multimedia and visual resources into an online module;
    e. Utilizes synchronous and asynchronous tools effectively;

f. Troubleshoots typical software and hardware problems;
g. Demonstrates the ability to effectively use and incorporate subject-specific and developmentally appropriate software in an online learning module; and
h. Demonstrates growth in technology knowledge and skills in order to stay current with emerging technologies.

METHODOLOGY, MANAGEMENT, KNOWLEDGE, SKILLS AND DELIVERY

- *Standard*: The teacher plans, designs and incorporates strategies to encourage active learning, interaction, participation and collaboration in the online environment.
- *Indicators*:
  – *The teacher*:
    a. demonstrates effective strategies and techniques that actively engage students in the learning process;
    b. facilitates and monitors appropriate interaction among students;
    c. builds and maintains a community of learners by creating a relationship of trust, demonstrating effective facilitation skills, establishing consistent and reliable expectations, and supporting and encouraging independence and creativity;
    d. promotes learning through group interaction;
    e. leads online instruction groups that are goal-oriented, focused, project-based and inquiry-oriented;
    f. demonstrates knowledge and responds appropriately to the cultural background and learning needs of non-native English speakers;
    g. differentiates instruction based on students' learning styles and needs and assists students in assimilating information to gain understanding and knowledge; and
    h. demonstrates growth in teaching strategies in order to benefit from current research and practice.
- *Standard*: The teacher provides online leadership in a manner that promotes student success through regular feedback, prompt response and clear expectations.
- *Indicators*:
  – *The teacher*:
    a. Consistently models effective communication skills and maintains records of applicable communications with students;

b. Encourages interaction and cooperation among students, encourages active learning, provides prompt feedback, communicates high expectations, and respects diverse talents and learning styles;
c. Persists, in a consistent and reasonable manner, until students are successful; z establishes and maintains ongoing and frequent teacher-student interaction, student-student interaction and teacher-parent interaction;
d. Provides an online syllabus that details the terms of class interaction for both teacher and students, defines clear expectations for both teacher and students, defines the grading criteria, establishes inappropriate behaviour criteria for both teacher and students, and explains the course organization to students;
e. Provides a syllabus with objectives, concepts and learning outcomes in a clearly written, concise format;
f. Uses student data to inform instruction, guides and monitors students' management of their time, monitors learner progress with available tools and develops an intervention plan for unsuccessful learners;
g. Provides timely, constructive feedback to students about assignments and questions; and
h. Gives students clear expectations about teacher response time.

- *Standard*: The teacher models, guides and encourages legal, ethical, safe and healthy behaviour related to technology use.
- *Indicators*:
  - *The teacher*:
    a. Facilitates student investigations of the legal and ethical issues related to technology and society;
    b. Establishes standards for student behaviour that are designed to ensure academic integrity and appropriate uses of the Internet and written communication;
    c. Identifies the risks of academic dishonesty for students;
    d. Demonstrates an awareness of how the use of technology may impact student testing performance;
    e. Uses course content that complies with intellectual property rights policies and fair use standards;

f. Provides students with an understanding of the importance of Acceptable Use Policies;
g. Demonstrates knowledge of resources and techniques for dealing with issues arising from inappropriate use of electronically accessed data or information; and
h. Informs students of their right to privacy and the conditions under which their names or online submissions may be shared with others.

- *Standard*: The teacher has experienced online learning from the perspective of a student.
- *Indicators*:
  - *The teacher*:
    a. Applies experiences as an online student to develop and implement successful strategies for online teaching;
    b. Demonstrates the ability to anticipate challenges and problems in the online classroom; and
    c. Demonstrates an understanding of the perspective of the online student through appropriate responsiveness and a supportive attitude towards students.
- *Standard*: The teacher understands and is responsive to students with special needs in the online classroom.
- *Indicators*:
  - *The teacher*:
    a. Understands that students have varied talents and skills and uses appropriate strategies designed to include all students;
    b. Provides activities, modified as necessary, that are relevant to the needs of all students;
    c. Adapts and adjusts instruction to create multiple paths to learning objectives;
    d. Encourages collaboration and interaction among all students;
    e. Exhibits the ability to assess student knowledge and instruction in a variety of ways; and
    f. Provides student-centred sessions and activities that are based on concepts of active learning and that are connected to real-world applications.
- *Standard*: The teacher demonstrates competencies in creating and implementing assessments in online learning environments in ways that assure validity and reliability of instruments and procedures.

- *Indicators*:
  - *The teacher*:
    a. Creates or selects fair, adequate and appropriate assessment instruments to measure online learning that reflect sufficient content validity, reliability and consistency over time; and
    b. Implements online assessment measures and materials in ways that ensure instrument validity and reliability.
- *Standard*: The teacher develops and delivers assessments, projects and assignments that meet standards-based learning goals and assesses learning progress by measuring student achievement of learning goals.
- *Indicators*:
  - *The teacher*:
    a. Continually reviews all materials and Web resources for their alignment with course objectives and state and local standards and for their appropriateness;
    b. Creates assignments, projects and assessments that are aligned with students' different visual, auditory and hands-on ways of learning;
    c. Includes authentic assessment as part of the evaluation process;
    d. Provides continuous evaluation of students to include pre- and post-testing and student input throughout the course; and
    e. Demonstrates an understanding of the relationships between and among the assignments, assessments and standards-based learning goals.
- *Standard*: The teacher demonstrates competencies in using data and findings from assessments and other data sources to modify instructional methods and content and to guide student learning.
- *Indicators*:
  - *The teacher*:
    a. Assesses each student's background and content knowledge and uses these data to plan instruction;
    b. Reviews student responses to test items to identify issues related to test validity or instructional effectiveness;
    c. Uses observational data to monitor course progress and effectiveness; and

d. Creates opportunities for self-reflection or assessment of teaching effectiveness within the online environment.

- *Standard*: The teacher demonstrates frequent and effective strategies that enable both teacher and students to complete self- and pre-assessments.
- *Indicators*:
  - *The teacher*:
    a. Employs ways to assess student readiness for course content and method of delivery;
    b. Employs ways for students to effectively evaluate and assess their own readiness for course content and method of delivery;
    c. Understands that student success is an important measure of teaching and course success; and
    d. Provides opportunities for student self-assessment within courses.

THE FUTURE OF ONLINE TEACHING AND LEARNING IN HIGHER EDUCATION

Institutions of higher education have increasingly embraced online education, and the number of students enrolled in distance programmes is rapidly rising in colleges and universities throughout the United States. In response to these changes in enrollment demands, many states, institutions, and organizations have been working on strategic plans to implement online education.

At the same time, misconceptions and myths related to the difficulty of teaching and learning online, technologies available to support online instruction, the support and compensation needed for high-quality instructors, and the needs of online students create challenges for such vision statements and planning documents. In part, this confusion swells as higher education explores dozens of e-learning technologies with new ones seeming to emerge each week. Such technologies confront instructors and administrators at a time of continued budget retrenchments and rethinking. Adding to this dilemma, bored students are dropping out of online classes while pleading for richer and more engaging online learning experiences. Given the demand for online learning, the plethora of online technologies to incorporate into teaching, the budgetary problems, and the opportunities for innovation, we argue that online learning environments are facing a "perfect e-storm," linking pedagogy, technology, and learner needs.

Considering the extensive turbulence created by the perfect storm surrounding e-learning, it is not surprising that opinions are mixed about the benefits of online teaching and learning in higher education. As showed in numerous issues of the Chronicle of Higher Education during the past decade, excitement and

enthusiasm for e-learning alternate with a pervasive sense of e-learning gloom, disappointment, bankruptcy and lawsuits, and myriad other contentions. Appropriately, the question arises as to where online learning is headed.

Navigating online education requires an understanding of the current state and the future direction of online teaching and learning. The study described here surveyed instructors and administrators in postsecondary institutions, mainly in the United States, to explore future trends of online education. In particular, the study makes predictions regarding the changing roles of online instructors, student expectations and needs related to online learning, pedagogical innovation, and projected technology use in online teaching and learning.

3

Tools of Information Technology in Learning

SYSTEM IMPLEMENTATION STRUCTURE

To implement the WBE we propose the system implementation structure. The school classrooms, office and training centers are connected through Intranet. This Intranet is connected to the Internet by using network operating system. Firewall is introduced between Intranets and Internet in order to provide security.

System Description

In initial stage of school education the students are not expert in reading and writing. Subject understanding increases if they learn the things through visualization. With the help of multimedia or Rich Media, which includes, Audio, video, graphics and Java Applets have made WBE very effective.

In the primary stage students don't have good knowledge of English. Therefore the presentation should be available in their mother tongue for the better understanding, which is also helpful in improving their pronunciation. This is possible by developing Natural Language Interface to database. One important device called, as "Tech Commander" is also useful for teachers to identify students potential by viewing any students computer display on his own monitor. If he finds something that everyone should see he could set everyone's monitor to display it.

Web Based Education: Considerations and Approaches

- *Conversion of Existing Material*: In order to shift from traditional education to WBE we have to convert the existing school educational material to the Web. The important points to consider are bandwidth, design, usability, and the necessity of high quality media elements and consistency of material across the mediums.
- *Authoring for Multiple Delivery Environments*: We have to provide consistency of interface and ease of authoring and design of an effective multi platform course.
- *Using the Web for student/Teacher Interaction*: Web site can be used for posting of assignments, student work and marks, along with the ability to submit work on-line through the site, also JavaScript and JAVA applets to demonstrate course concepts interactively. This means that course delivery on the Web must be dynamic and truly interactive between the instructor and the students.
- *Faculty Support and Training:* We have to provide centralized support and training resources for training the teachers initially.

Problems to be faced while implementing WBE in school education in Indian context: Looking at how to use Information Technology in school education, its different tools, the system structure as defined and described it is obvious that we will face some problems while implementing WBE in school education in India.

The major problems we will be facing are:

- Intensive Training to Schoolteachers: Schoolteachers are not introduced to the web based education. Therefore training should be given in order to create a learning environment that will itself train and spur students on the one hand to turn the learning experience into useful, practical and personal knowledge.
- WBL awareness and Workshops: In rural area parents are not much knowing about WBL. So the demonstration, seminars and workshops needs be conducted for society in order to understand the importance of it.
- *Bandwidth Limitations*: Limited bandwidth of Internet connection gives slower performance for sound, video and intensive graphics, causing long waits for downloads that can affect the ease of the learning process. Improved bandwidth will help the teacher to solve his problem.
- *Effect on Teachers*: WBL will lead to reduction in manpower as per as teachers are concerned. This will lead to agitations by teacher's organization.

- *Effect on Students*: Although the students will be benefited by WBL there will some part of students opposing this introduction of technology in education.
- Infrastructure: WBE will primarily require free access to Web to all the learners and hence government of India will have to setup nation wide Fibre Optic Cable network.
- *Access*: Every school will not have equal opportunity to information because of access issues. The schools with fewer budgets will always face this problem. This is the major problem as per as India is concerned, as there is big gap between poor and rich communities in India.
- *Download*: The learning material that appears on web needs to be downloaded will require more time. The speed depends on the transmission methods and bandwidth, which is problem as per as India is concerned.

Important Features of Web-Based Learning Environment

While designing Web-Based Learning sites the following important features should be kept in mind:

- *The Online Syllabus*: An online syllabus provides the instructor with a way to change course material easily and as per the requirements in industry, and the student will have a complete and up-to-date picture of the course requirements. Hypertext links to sample relevant disciplinary web sites may be helpful in giving students (and also prospective students) a sense of the disciplinary context for the course.
- *Personal Home Pages*: Personal home pages can be used to foster the sense that the class is not just a collection of isolated individuals but a community of learners who can profit from interacting with one another. Home pages encourage students to learn about each other so as to encourage contact and mutual interests. This helps the learners to create a group with common interest.
- *Interactivity*: Adding discussion forums and chat sessions to your online course is a common way to add an interactive component to a web-based course. There are many implementations of bulletin board and chat session software to choose from. A second method of interactivity is, of course, e-mail. It's a good practice to have an online list of the e-mail addresses of all registered students, the professor, and teaching assistants. This is possible with an e-mail subscription mechanism included in your Online Syllabus.

- *Assignments*: The web page listings of homework assignments, upcoming events and exams can be more interactive than the familiar print counterparts. If some homework assignments, for example, are based on online materials, they can be directly linked to the class schedule. This helps the students to plan the preparations for the examination in systematic way.
- *Announcements*: To be effective, announcements need to be read; for that to happen, students need to know when a new announcement has been posted. Alert sounds or perhaps a blinking link added to a page can let students know of new announcements, or perhaps, even a mass e-mail to all students in the course. For a home page, or a long life syllabus, various software tools can be used for the subscribers announcement about page changes. All these techniques will attract the learner's attention towards announcements.
- *Testing*: Online drill or practice testing can be used to reinforce material, even if the results are not used as part of a grade. Reading comprehension questions, for example, in short answer or multiple choice formats can provide students with an assessment of their level of understanding of text. This facilitates the students to measure his level of understanding and through continuous assessment he can try to improve his performance.
- *Course Management*: Software should be available to add or delete students from the course, assign user Ids and passwords, create or edit home pages, and manage any open discussion groups. This helps to keep up to date records of students admitted for various courses.
- *Content*: Perhaps the most difficult part of developing a web-based course is creating the online contents. You can begin by transferring your basic lecture materials to the web and integrating media such as sound, images, and video. Remember, to experiment with incorporating some of the new web-based learning paradigms. And finally, come back and rebuild the lecture building its graph structure and using more html facilities.

Other Features of a Web-Based Learning Environment

- Managing cognitive load — the amount of information people can process — is essential to effective teaching or training. Bombarding learners with too much information at once, called cognitive overload, is one of the chief obstacles to learning. This indicates that we should provide only required information in order to avoid cognitive overload.

- Dividing each tutorial lesson into segments (Classroom, Quiz, Lab, *etc.*) and then further subdividing these segments into a manageable number of chunks allows users to digest new concepts and skills in a manner that prevents overload.
- *Web-based tutorial*: Users will also enjoy a great deal of flexibility in managing their cognitive load, selecting instructional tasks from a menu of lessons, depending upon the amount and kinds of skills they bring with them, and once engaged in a lesson, selecting which portions of that particular lesson they wish to complete. This allows the students to learn the topics in proper sequence and according to his ability of understanding.
- Because the limited capacity of working memory is rapidly overwhelmed by large amounts of new information, frequent opportunities to practice are important. Rehearsal encodes or moves information into long-term memory. The practice assignments can be presented with practice opportunities throughout the classroom portion of the lesson and is also encouraged to complete the practice portion of each lesson. This allows the student to find out how much he has understood at the end of learning a particular module.
- Finally, online testing is used to reinforce material. Elaborative rehearsal involves presenting questions, which allow the user to apply knowledge in an appropriate context, thus encoding it into permanent memory.
- Quiz questions are designed to provide an authentic assessment of user skill levels by calling on the user to apply the appropriate techniques and practices from the lesson.

New Technologies for Sexual Exploitation

Digital Video Disk

One new technology is Digital Video Disk (DVD), which provides high quality videos and interactive capabilities for the viewer. While making the videos, scenes can be shot from multiple angles, and all points of view can be added to a CD ROM. The viewer can then choose the version, point of view, or camera angle he/she prefers.

Viewers can watch the movie in chronological order, moving from one character to the next, or watch the movie from one character's point of view. Viewers can interact with DVD movies in much the same way they do with video games, giving them a more active role.

According to one producer:

- If a viewer wants something different, we give it to him. The viewer can go inside the head of the person having sex with, male or female. He can choose which character to follow.

He can re-edit the movie. It's a great technology. The following is a description of a recent pornographic movie recorded on DVD:

- Chasing Stacy from VCA Labs, is a choose-your-own-adventure flick that follows Stacy the porn star as she signs autographs, drinks coffee, works out at the gym and takes a shower. At various points, a small green icon appears in the corner of the screen and Stacy looks straight at the camera. That's when viewers get the chance to ask Stacy out on a virtual date by pressing the Enter button on the DVD remote control. The date scenes are filmed so that the viewer feels like he's sitting directly across a glass table from Stacy, who provides insights into her personal life. Later, the viewer can select whether to take Stacy back to her house, to her office, or to another locale for a tryst. With the remote control, the details can be chosen as the action unfolds.

The pornography producer, VCA, released this DVD in July 2000 and sold more than 12,000 copies by January 2001, making it the fastest selling title they have. Although technologies like this have many applications and enable creativity and interactivity, when used in pornographic films, these raise the question of the impact on people, their relationships, and expectations about relationships.

A portion of men who use pornography and seek out women in prostitution do so either because their lack of social skills or their misogynistic attitudes prevent them from establishing relationships with their peers. Technology such as this may further distance and alienate some men from meaningful and realistic relationships.

There are a number of venues and media formats with different technologies for the transfer of files and communications, including Usenet newsgroups, World Wide Web, e-mail, live synchronous communication, bulletin or message boards, Web cams for live transmission of images or videos, live video conferencing, streaming video, peer to peer servers, and file sharing programmes.

All forums and applications offer ways to engage in the sexual exploitation of women and children. How each is used for sexual exploitation depends on the legality of the activity, which varies from country to country, the techniques adopted by the sex industry or individual users, and the level of privacy or secrecy attempted by the users. Perpetrators have taken advantage of new technologies and applications to stalk victims, transmit illegal materials, and avoid detection by law enforcement.

Newsgroup

Usenet newsgroups are still popular sites for the exchange of information on how to find women and children for sexual exploitation. Although much media attention is given to child pornography rings and cases that use sophisticated technologies to keep their activities secret, such as the Wonderland Club that used a Soviet KGB code to encrypt all its communications, the older public newsgroups are still commonly used to upload and download child pornography. The COPINE Project reports that over 1000 child pornographic images are posted on newsgroups each week.

Web Sites

Web sites are used in various ways to assist in the sexual exploitation of women and children. Web sites are the most popular venue for the distribution of pornography online. Large legal sex industry businesses have sophisticated web sites with subscription fees that bring in millions of dollars per year. There are also tens of thousands of free pornography sites that are maintained by amateurs or someone making a relatively small amount of money from advertising banners for larger sites and businesses.

Web sites offer streaming videos that can be viewed with web browser plug-ins. The most recent versions of web browsers come packaged with these plug-ins. Pimps and traffickers use the web to advertise the availability of women and children for use in making pornography.

One example includes prostitution tourists and Western producers of pornography who have been traveling to Latvia since the early 1990s to find vulnerable children and young adults to sexually exploit in their videos. In August 1999, the Vice Police in Latvia initiated criminal proceedings against the owners of Logo Center, a "modeling agency," for production of pornography and the use of minors in the production of pornography.

The two managers of the Logo Center provided women and children to foreign prostitution tourists and foreign pornography producers. They had several web sites with pornography, information about minors, and photographs of their "models" in different sex acts. During the time these pimps operated they exploited approximately 2000 women, men, girls and boys, resulting in 174 juveniles relying on prostitution for their basic livelihood. The Logo Center supplied women and children for pornography production in other countries. In one case they supplied "porno models" to a Swedish pornography producer who made videos in Finland. The Logo Center Web site had links to other sites with bestiality and child pornography.

After being arrested, the two owners were charged with distribution of child pornography.

- Pimps also use web sites to advertise their brothels or escort services directly to men. These sites are often used to attract foreign businessmen or tourists. The following is from a web site in Prague,

> Czech Republic: Would you like to spend an exciting night in Prague with a beautiful young girl? She will do everything for your pleasure. She will make you happy with kissing you on your mouth, French sex and sexual intercourse. During your stay, you can visit the "Golden City" with your girl. The girls are pupils and students, who are financing their education.

Increasingly, prostitution web sites include photographs of the women, sometimes nude. This practice exposes women, identifying them to the public as prostitutes. Many of the photographs look like modeling photographs, and the women may never have intended for those photographs to be used to advertise them as prostitutes. Some of the women may not even know their photographs are on web sites. Women suffer from the stigma placed on them for being in prostitution. This public display and labeling further harms women in prostitution.

Web based message boards and bulletin boards are increasingly popular for an exchange of information by perpetrators of sexual exploitation. They are used in much the same way as newsgroups, but can be private and protected by passwords. Using these applications, men can book sex tours and "appointments" with women through the web, e-mail and chat rooms. Message boards on brothels' web sites enable men to post "reviews" of the women for other men, and communicate with pimps about the women's appearances and "performances."

On sites where the women's photos are displayed, men can evaluate the women:

7• Alina´s new photos indicate that she has gained some extra weight!! Please advise what is her weight currently. Thanks and regards...

Another example includes:

- Dear Milla:
  - What happened to Alina? She seems that she gained some weight since the last time she was with you. She must not be 52Kg as written on her page. Please advise her exact weight.

Men use message boards to make reservations for their upcoming visits. A Web site for a brothel in Prague, Czech Republic had the following message and request:

- Hallo Mila ! I found your page on the Internet. I´m going to Prague this summer and probably will visit your establishment. How long time before do one have to make reservations ? Could you please put out some more photos of the girls. Is there also possible to have analsex with the girls if you stay overnight ? See you !/Peter

Another posting included:

- I understand from our talk, by telephone you have, 6 girls our more, ATT the time, girls are from Ukraine. I will be in Praha, late August

> 2000, So I will arrive to Praha, late at night, if I remember rite, me flights is from Iceland to Copenhagen and from Copenhagen to Praha. do you have some taxi our pick up from the airport? I \like to stay in your house the first 2 nights when I am testing your girls after that I will know which of your girls I like. I will chosen one of them to stay in me hotel four 2 nights, so I will have one of your girls, one hour at the time in your house before I chosen which one I chosen to stay with me in me hotel, is that ok with you? I understand you have 6 girls, I would prefer to have sex with all of them, and then chosen one of the to stay in me hotel four 2 night after thatch, is thatch ok with you? Are your girls shaved? Ragnar

Web sites are also used to market images and videos of rape and torture. Slave Farm, a web site registered in Denmark, claims to have the "world's largest collection of real life amateur slaves." Men are encouraged to "submit a slave to the picture farm."

The images include women being subjected to sexual torture, bondage, and fetish sadism. Description of images include: "needle torture," "hot wax," "extreme hogtie," "hanging bondage," "tits nailed to board," "drunk from the toilet," and "pregnant bondage." Live chat is available where men can "command the bitches." A number of images are available free, but full access requires payment of a subscription fee.

The women in the images and videos are visibly injured, with cuts, burns, bruises, welts, and bleeding wounds. Another web site registered in Moscow, Russia advertises itself as "the best and most violent rape site on earth." It claims to have "Several Hunders of rape pics." Subscribers are offered 30,000 hardcore porn images, 500 online video channels, and 100 long, high quality videos. There are images and videos of "violent rapes, ass rapes, mouth rapes, gang rapes, nigger rapes, torn vaginas, and tortured clits."

A free 13 MB video and audio movie can be downloaded in 12 segments, each about 1 MB. The film shows a hooded perpetrator raping a woman in an office. Previously, few people had access to such extreme material.

As one consultant explained:

- [f]ormerly men used to have to remove themselves from their community by three levels [to find extreme, violent pornography]. First, they had to go somewhere, physically, then know where to go, and then know how to find it. The Web makes it very easy to get that far removed very quickly."

The resurgence of child pornography through the internet is a priority for some law enforcement agencies, resulting in unparalleled international cooperation to break up the rings. In contrast, the pornography of adults and post adolescent teens has been ignored. In the United States and Europe, there are very few cases of prosecution of producers of adult and post adolescent teen

pornography. A lot of the pornography is extremely misogynistic, with women portrayed as seeking and enjoying every type of humiliation, degradation, and painful sex act imaginable. Women and children are harmed physically, sexually, and emotionally in the making of pornography. Although, there is less information about women in pornography, it is likely that many women are coerced into making pornography just as they are coerced into prostitution. In addition, by filming the violence and sex crimes against women and post adolescent teens, thereby turning it into pornography, images of these violent crimes can be distributed publicly on the internet with no consequences to the perpetrators.

The percentage of degrading, violent, misogynistic pornography continues to increase, and the images and videos become more readily available. However, there doesn't seem to be anything new in the content of pornography; perpetrators have always raped and tortured women and children in the making of pornography. What is new is the volume of pornography produced and the fact that an average person with a computer, modem and search engine can find violent, degrading images within minutes, a search that could have taken a lifetime, just fifteen years ago.

The increase in video clips with audio and streaming video makes the action and harm come alive. New techniques, such as shockwave flash movies, enable the creation of animated videos. Skilled amateurs can create snuff films for distribution on the Web. One person I interviewed said that "[w]ith virtual film, it is possible to produce a snuff film from animation, but very difficult to tell it is not real. Now, we are limited only by our imaginations. There is nothing that can't happen on the Web."

Chat Rooms

Real time synchronous communication, or "chat," is a popular means of communication on the internet. Chat is available through Internet Relay Chat (IRC) channels, Instant Messaging, such as ICQ, Web based chat sites which are accessed through browsers, Multi-User Dimension (MUD) or Multi-User Simulated or Share Hallucination (MUSH) programmes.

There are over 100,000 chat rooms available to users worldwide. Some of these formats and the "rooms" users create are open to the public, some are private and require passwords, and others are used for one to one communication. No messages are archived or stored and no log files are maintained, as is done with e-mails or web accesses, so stalkers use them to look for victims without the danger of being traced by law enforcement authorities.

There have been numerous cases in the United States and the United Kingdom, where predators contact children for both online and physical meetings. Often, during these meetings, the children are emotionally and sexually abused. There have also been numerous cases of online stalking of adults that began with conversations in chat rooms, which led to physical meetings that turned into sexual assaults. In chat rooms, perpetrators engage children in sexual

conversation or expose them to sexual material, including adult and child pornography. Predators sexually exploit children online through this sexual talk.

Perpetrators ask children to send them pictures or sexual images of themselves or their friends. They may encourage the children to perform sex acts on themselves or friends for the stalker's sexual satisfaction. Stalkers use these activities as part of a grooming process to entice children into more direct contact, such as telephone conversations and eventual physical meetings. When the child stalkers use voice chat the predators and stalkers encourage the children to get headphones to reduce the risk of someone else in the house hearing the voices.

They suggest that children get web cameras for their computers and move their computers to their bedrooms where the stalker can encourage sexual touching and masturbation while they watch via a Web cam.

- A typical ruse employed by paedophiles is when the predator asks the victim what she is wearing. This is usually followed by asking her to take something off such as her underwear. The more cunning paedophile will say something more innocuous like 'do you enjoy taking showers,' swiftly followed by 'do you touch yourself in the bath?' It is also commonplace to ask the girl if she has pubic hair in order to build up a mental picture of her level of physical maturity. The intention of most paedophiles is to engage the girl in cybersex activities.

In one transnational case, Franz Konstantin Baehring, a thirty-sevenyear-old German man living in Greece, contacted a fourteen-year-old girl from Florida in a chat room. He followed his Internet communication with letters by mail and telephone calls. After a year of corresponding, he convinced the girl to run away from home and travel to Greece.

To assist the girl in leaving her home, Baehring contacted a woman at a mobile phone store and convinced her to assist an "abused girl in leaving home." The woman met the fourteen-year-old, gave her a programmed cell phone and drove her to a local airport. The girl flew to Ohio, where Robert Arnder, a convicted child pornographer and one of Baehring's contacts, assisted the girl in getting a passport and leaving the United States: Baehring paid Arnder $2000 dollars for his assistance. Police were able to trace the girl's travels and her contacts by examining the e-mail messages left on her computer at home. Upon investigation of Robert Arnder, who assisted the girl in Ohio, they found that Arnder had pornographic images and videos of his own thirteen and seventeen-year-old daughters on his home computer.

He had sexually abused his daughters for at least five years. Arnder has since been indicted on 147 counts of rape, 145 counts of sexual battery, two counts of compelling prostitution, six counts of pandering obscenity involving a minor, four counts of pandering sexually oriented material involving a minor, three counts of child endangerment and one count of interference with custody. In Greece, Baehring kept the fourteen-year-old girl under control by locking her

in an apartment in Thessaloniki. She was not permitted to answer the phone or the door. The girl's friends received e-mail messages sent from Internet cafés in Athens and Thessaloniki saying that she was happy. Baehring told his mother that he felt pity for her because she suffered from leukemia and he was trying to make her happy. He told the girl that he was a child psychologist who specialised in hypnotherapy and ran a youth center.

When authorities found Baehring, he was charged with abduction of a minor with malicious intent, sexual assault and exposing a minor to improper material. Investigation of Baehring's home revealed child pornography of other girls. He is suspected of involvement with pornography rings on the internet. The girl suspects that Baehring may have had other girls under his control and used them in making pornography.

The international effort to find the missing girl involved the Polk County Sheriff's Office in Florida, the U.S., State Department, the U.S., Customs Department, U.S., Postal Inspectors, the FBI, Interpol, the U.S., Embassy in Greece, the Greek Consulate and the police in Greece. The international cooperation has been praised, but the intensity of these efforts also highlights the resources needed to find one girl, and there are thousands of girls missing each year from parts of the world where such resources and cooperation don't exist.

File Transfer Protocol

Although File Transfer Protocol (hereinafter FTP), is one of the oldest ways of exchanging files on the Internet, it is still popular with child pornography collectors for one-to-one exchange of child pornography. FTP allows users to have direct access to another person's computer hard drive to upload and download files.

This technique of file exchange is more likely to occur between child pornography collectors who have met in other venues and have come to trust each other.

Live Video Chat

Every venue on the internet is used to transmit images of sexual exploitation. The number of video clips is increasing and streaming video is available for those with high-speed Internet connections. Live Web broadcasts have become common. In 2000, a case of human smuggling and trafficking was uncovered in Hawaii, U.S.A., in which Japanese women were trafficked into Honolulu to perform live on the Internet for audiences in Japan.

Due to more restrictive laws concerning pornography in Japan, the men decided to operate their web site from Hawaii and broadcast the live shows back to Japan. The Japanese men in Hawaii placed ads in Japan for "nude models." Upon their arrival in Hawaii, the women were used to make pornographic films and perform live Internet sex shows. The entire operation was aimed at a Japanese audience. The web site was written in Japanese.

The women performed strip shows by web cam and responded to requests from men watching in Japan. They used wireless keyboards for live sex chat with the men at a rate of $1 per minute. The Japanese men, operating as Aloha Data, used digital cameras to capture the live video chat, then transmitted it to a server in California run by a "not respectable, but not illegal" Internet service provider called Lucy's Tiger Den. Japanese viewers accessed the performance through the California server. The U.S., Immigration and Naturalisation Service pursued the case, not because of the pornographic content of the broadcast or the sexual exploitation of the women, but because of immigration violations.

This case offers some twists in crime, human smuggling or trafficking and new technologies. James Chaparro, Director of the Anti-Smuggling and Trafficking Unit, U.S., Immigration and Naturalisation Service, characterised the case in this way: "The Japanese men violated U.S., immigration law by smuggling/trafficking Japanese women into the U.S., in order to circumvent the Japanese law against pornography."

Omer Poirier, U.S., Attorney in Honolulu, who handled the case described it in this way: "Japanese men were smuggling women into the U.S., from Japan to provide services for men in Japan."

Peer-to-Peer Networks and File Swapping Programmes

In the last two years, a new technology was developed and released as freeware that can create a network of peer computers. The result is an open, decentralised, peer-to-peer system. File swapping programmes are used to find files on the network. Using the programme the user designates one directory on his/her computer that will be open to the public and another for downloaded files. When the user logs onto the internet, he/she will be automatically connected to all other people running the same programme.

All available files are indexed into a large searchable database. When keywords are entered the request moves from one computer to the next returning links to files. At that point, the programme can download the requested files from other members' network computers. It is toted as a revolution in how computers and people communicate with each other on the internet. Examples of these peer to peer networks include: Napster, Scour Exchange, Gnutella, Freenet, Imesh.

These programmes create a decentralised system, meaning there is no central server through which all communications pass. Consequently, there are no logs of transmissions, and transmissions are not traceable because each site can only trace the connection back one level. You can enter the public network or create a private one of your own.

These features this new information technology so attractive to perpetrators:

- [S]oftware that turn[s] your PC into both a client and a server. They'll create a true Web by allowing users to easily connect directly to each other.... Download Gnutella and you can trade any type of file, pirated or not, with anybody else on the Gnutella network in virtual anonymity.

Gnutella has a monitoring feature that allows users to monitor the searches of others to see what people are searching for. U.S., Customs Cyber Smuggling Center "most searches on these networks are for adult and child pornography."

Technologies for Anonymity and Disguise

For those engaging in criminal activity or sexual exploitation, anonymity and disguise are critical. Criminals in general are using new communications technologies, such as mobile phones, to avoid police tracing of their phone calls.

Mobile phone services often offer free or cheap phones for signing up for their services. Criminals use these phones for a week, and then discard them. Pre-paid phone cards enable anonymous use of landline telephone systems. Users of cellular and satellite phones can be located far away from their home bases and still be able to use their phones. Mobile phones can be programmed to transmit false identification.

Those engaging in international sexual exploitation use new technologies for ease of communication and to avoid detection. Criminals can avoid being traced by sending their communication through a series of carriers, each using different communication technologies, such as local telephone companies, long distance telephone companies, internet service providers, wireless networks, and satellite networks.

They can send the communication through a number of different countries in different time zones. This complicated routing of communication makes it difficult to trace the perpetrator. In addition, criminals can avoid identification by transmitting their messages over the Internet through a series of anonymous re-mailers that strip off identifying headers and replace them with new ones. One remailer service removes identifying features from the header, holds all incoming message until five minutes after the hour, and then resends them in random order to make tracing an individual message more difficult.

Messages can pass through up to twenty other re-mailer services, with at least one located in a country known for its lack of cooperation with the global community and law enforcement. Perpetrators can also utilize technologies that do not save incriminating evidence. New technologies like Web TV, in which web communications are displayed on a TV, do not have a file cache, like browsers installed on a computer.

Therefore, illegal material is not accidentally left in the cache to be discovered by the police. Encryption is a technology used to disguise the content of either text or graphics files. Currently, there is a debate among lawmakers around the world about whether law enforcement agencies should be provided with encryption keys so they can decode messages if there is evidence of its use in committing a crime. Several law enforcement officials in the United Kingdom and the United States indicated that at this point the capabilities and threat of encryption seem to be talked about more than they used to for cases of trafficking and sexual exploitation. Encryption programmes are not easy to use, and other methods of hiding activity or content are more popular and easier to manage.

Technologies of Cyber Hijacking

The sex industry uses techniques such as "page jacking" to misdirect or trap people on pornographic web sites as page after page of pornography opens up. Page jacking is a technique the sex industry uses to misdirect users so they mistakenly come to their web sites. The web sites include false key-word-descriptions so that the search index will bring these individuals on to pornographic web sites.

The users will then click on the link of their chosen topic, only to find themselves on a pornographic web site. Another technique used by the sex industry is called "Mouse-trapping." "Mouse trapping" occurs when the sex industry web page designers disable browser commands, such as "back" or "close," so that viewers cannot leave a pornographic site. Once intended or unintended viewers are on pornographic sites, they are trapped on the pornographic sites because the "back" or "close" buttons/icons are disabled so that when clicked, another pornographic web site opens up, resulting in an endless number of web pages opening up on the viewer's screen.

In addition, pornographic web sites can change the default homepage setting on a web browser, so the next time the user opens the browser he/she is taken directly to the pornographic site. Furthermore, the sex industry has no idea who they are trapping on their web sites, whether they are children or adults who fervently 4do not want to view pornography. Pornographers are very aggressive about using popular current events and search subjects to misdirect viewers. The sex industry has exploited just about any topic on the web to trap people onto its web sites. Pornographers will even exploit the arrests of other pornographers.

STRATEGIES FOR LEARNING AT A DISTANCE

The primary role of the student is to learn. Under the best of circumstances, this challenging task requires motivation, planning, and the ability to analyse and apply the information being taught. In a distance education setting, the process of student learning is more complex for several reasons:

- Many distance-education students are older, have jobs, and families. They must coordinate the different areas of their lives which influence each other ' their families, jobs, spare time, and studies.
- Distant students have a variety of reasons for taking courses. Some students are interested in obtaining a degree to qualify for a better job. Many take courses to broaden their education and are not really interested in completing a degree.
- In distance education, the learner is usually isolated. The motivational factors arising from the contact or competition with other students is absent. The student also lacks the immediate support of a teacher who is present and able to motivate and, if necessary, give attention to actual needs and difficulties that crop up during study.

- Distant students and their teachers often have little in common in terms of background and day-to-day experiences and therefore, it takes longer for student-teacher rapport to develop. Without face-to-face contact distant students may feel ill at ease with their teacher as an "individual" and uncomfortable with their learning situation.
- In distance education settings, technology is typically the conduit through which information and communication flow. Until the teacher and students become comfortable with the technical delivery system, communication will be inhibited.

Distant Students' Development as Learners

Beginning students may have some difficulty determining what the demands of a course of academic study actually are because they do not have the support of an immediate peer group, ready access to the instructor, or familiarity with the technology being used for delivery of the distance-education course. They may be unsure of themselves and their learning. Morgan (1991) suggests that distant students who are not confident about their learning tend to concentrate on memorizing facts and details in order to complete assignments and write exams. As a result, they end up with a poor understanding of course material. He views memorization of facts and details as a 'surface approach' to learning and summarizes it as follows:

- *Surface approach:*
  - — Focus on the "signs" (*e.g.*, the text or instruction itself).
  - — Focus on discrete elements.
  - — Memorize information and procedures for tests.
  - — Unreflectively associate concepts and facts.
  - — Fail to distinguish principles from evidence, new information from old.
  - — Treat assignments as something imposed by the instructor.
  - — External emphasis focusing on the demands of assignments and exams leading to a knowledge that is cut-off from everyday reality.

Distant students need to become more selective and focused in their learning in order to master new information. The focus of their learning needs to shift them from a 'surface approach' to a 'deep approach'. Morgan (1991) summarizes this approach as follows:

- *Deep Approach:*
  - — Focus on what is "signified" (*e.g.*, the instructor's arguments).
  - — Relate and distinguish new ideas and previous knowledge.
  - — Relate concepts to everyday experience.

— Relate and distinguish evidence and argument.
— Organize and structure content.
— Internal emphasis focusing on how instructional material relates to everyday reality.

Improving Distant Learning

The shift from 'surface' to 'deep' learning is not automatic. Brundage, Keane, and Mackneson (1993) suggest that adult students and their instructors must face and overcome a number of challenges before learning takes place including: becoming and staying responsible for themselves; "owning" their strengths, desires, skills, and needs; maintaining and increasing self-esteem; relating to others; clarifying what is learned; redefining what legitimate knowledge is; and dealing with content.

These challenges are considered in relation to distance education:

- *"Becoming and staying responsible for themselves":* High motivation is required to complete distant courses because the day-to-day contact with teachers and other students is typically lacking. Instructors can help motivate distant students by providing consistent and timely feedback, encouraging discussion among students, being well prepared for class, and by encouraging and reinforcing effective student study habits.
- *"Owning one's strengths, desires, skills, needs":* Students need to recognize their strengths and limitations. They also need to understand their learning goals and objectives. The instructor can help distant students to explore their strengths/limitations and their learning goals/objectives by assuming a facilitative role in the learning process. Providing opportunities for students to share their personal learning goals and objectives for a course helps to make learning more meaningful and increases motivation.
- *"Maintaining and increasing self-esteem":* Distant students may be afraid of their ability to do well in a course. They are balancing many responsibilities including employment and raising children. Often their involvement in distance education is unknown to those they work with and ignored by family members. Student performance is enhanced if learners set aside time for their instructional activities and if they receive family support in their academic endeavors. The instructor can maintain student self-esteem by providing timely feedback. It is critical for teachers to respond to students' questions, assignments, and concerns in a personalized and pleasant manner, using appropriate technology such as fax, phone, or computer.

Informative comments that elaborate on the individual student's performance and suggest areas for improvement are especially helpful.

- *"Relating to others":* Students often learn most effectively when they have the opportunity to interact with other students. Interaction among students typically leads to group problem solving. When students are unable to meet together, appropriate interactive technology such as E-mail should be provided to encourage small group and individual communication. Assignments in which students work together and then report back or present to the class as a whole, encourage student-to-student interaction. Ensure clear directions and realistic goals for group assignments.
- *"Clarifying what is learned":* Distant students need to reflect on what they are learning. They need to examine the existing knowledge frameworks in their heads and how these are being added to or changed by incoming information. Examinations, papers, and class presentations provide opportunities for student and teacher to evaluate learning. However, less formal methods of evaluation will also help the students and teacher to understand learning. For example, periodically during the course the instructor can ask students to write a brief reflection on what they have learned and then provide an opportunity for them to share their insights with other class members.
- *"Redefining what legitimate knowledge is":* Brundage, Keane, and Mackneson (1993) suggest that adult learners may find it difficult to accept that their own experience and reflections are legitimate knowledge. If the instructor takes a facilitative rather than authoritative role, students will see'their own experience as valuable and important to their further learning. Burge (1993) suggests having learners use first-person language to help them claim ownership of personal values, experiences, and insights.
- *"Dealing with content":* Student learning is enhanced when content is related to examples. Instructors tend to teach using examples that were used when they received their training. For distance learning to be effective, however, instructors must discover examples that are relevant to their distant students. Encourage students to find or develop examples that are relevant to them or their community.

Teaching and learning at a distance is demanding. However, learning will be more meaningful and 'deeper' for distant students, if the students and their

instructor share responsibility for developing learning goals and objectives; actively interacting with class members; promoting reflection on experience; relating new information to examples that make sense to learners; maintaining self-esteem; and evaluating what is being learned. This is the challenge and the opportunity provided by distance education.

STRATEGIES IN OPEN AND DISTANCE LEARNING

This paper is about the application of learning and instructional strategies in open and distance learning settings. First, a brief comment is made on the nature of open and distance learning and also teaching and learning in such settings. This is followed by a brief discussion of the impacts of particular types of learning and instructional strategies on learning. A framework is presented for applying learning and instructional strategies in open and distance learning contexts, and the translation of this framework into an instructional transaction that offers a generic plan for developing instruction.

This is, therefore, a conceptual paper. It discusses a theoretical framework for applying learning and instructional strategies that is currently being implemented in the design and development of instruction for an on-line (electronic) teaching-learning environment. The results of that implementation will be reported at a later date.

LEARNING AND INSTRUCTIONAL STRATEGIES

The pervasiveness of differences in learner performance in most instructional settings (including distance education) is evidence of the fact that there are, *inter alia,*different ways of going about learning. These ways of going about learning have been commonly referred to as learning strategies, cognitive strategies, study habits or approaches to studying. If particular learning strategies tend to be more effective for some learners and with certain kinds of subject matter, then it would seem appropriate to investigate if better learning and retention techniques can be taught.

Rigney (1978) describes a learning strategy as embodying the operations and procedures that learners use to acquire, retain, and retrieve different kinds of information. A learning strategy, therefore, may be conceptualised into two parts: (a) an orienting task for inducing learners to perform particular kinds of operations and which may be either prescribed by the instructional system or embedded in the instructional materials, and (b) one or more representational or self-directional learning capabilities which may also be either prescribed by an instructional system or generated by the learner.

Rigney proposed that, if learning strategies can be considered as either designer-imposed or learner-generated, then there are two ways in which cognitive processes can be enhanced with the help of instructional strategies to ensure maximum benefit for learners. These are as *embedded* strategies and *detached* strategies. Embedded strategies are not explicitly identified

independently of content. Instead, the instructional materials are designed to coerce learners into using particular processing resources in order to accomplish the orienting tasks that have been specified. Examples of these kinds of strategies would be factual or higher-order inserted and post-questions, instructional activities such as peer group discussions and writing and/or reading homework assignments. These would engage and direct learners into mental processing of specific aspects of their subject matter. These kinds of instructional strategies are commonly used in the design of print-based instructional materials in most DE settings and they have been found to influence cognitive processing capabilities of learners positively.

Detached instructional strategies, on the other hand, are applied independently of the subject matter and designed to teach learners or encourage them to use one or more learning activities in the process of learning. Examples of these strategies would be use of metaphors and/or analogies of concepts represented in the course content, concept and cognitive mapping. The instructional materials are designed in such a manner as to induce learners to apply particular cognitive processing resources in order to perform the specified tasks. These strategies are somewhat harder to teach and may require extensive practice before their effects are transferable to other situations. As such, they are less frequently applied in DE settings, although their effects on cognitive performance have reportedly been quite high.

The underlying premise of these approaches is that it is desirable, and also possible to teach students how to be more effective as learners in the acquisition, retention, and retrieval of information, as well as in the performance of given tasks in their materials. This is certainly not to imply that embedded or detached instructional strategies will work for all learners, all the time. It does say, however, that teaching learners how to learn and to retrieve what has been learned ought to be the primary concern of instructional systems and instructional designers.

Rigney has suggested that the application of instructional strategies in such a manner could compensate for a lower capacity for the acquisition, retention, and retrieval of information. Higher performers naturally tend to use more effective learning strategies than do lower performers. Therefore, training lower performers to acquire more effective learning strategies should enhance their acquisition, retention and retrieval capabilities. Thus, detached instructional strategies may be more beneficial to higher achievers who are more likely to be able to direct themselves through their tasks, and embedded strategies may be more useful to lower achievers as they are more likely to need more direct orienting tasks and greater support from the instructional systems. The best application scenario would seem to be to use both embedded and detached instructional strategies together and also selectively with different kinds of content so that learner deficiencies are compensated and their proficiencies optimised. Existing work on the application of instructional strategies in DE has emanated from different philosophical and psychological viewpoints. For

instance, Spencer (1980), Elton (1980), and Coldeway and Spencer (1982) have argued that Keller's Personalised System of Instruction has clear advantages for designing and managing DE systems. In contrast, Holmberg (1986) has argued that a cognitive orientation and strategies that enhance deeper-level processing of content, and which accommodate individual learning styles, best fits the DE context.

These are useful perspectives also but they represent only general approaches to the instructional process and do not offer specific guidelines for the application of learning and instructional strategies within the constraints of teaching at a distance. This paper argues that behaviour-analytic, cognitive and systems approaches are all useful perspectives for conceptualising the conditions of active learning.

The index of effect size for each of the selected instructional strategies, the magnitude of the effect of the instructional treatment. An effect size is a measure of the strength of a treatment condition against a control condition. An index of effect size is derived by subtracting the mean of the control condition from the mean of the experimental condition, and dividing this raw difference between the means with the standard deviation of the control condition for Glass's *ES,* and by a pooled standard deviation for Cohen's sd.

The result of this computation is a z-score (*i.e.*, a standardised score) which indicates the number of standard deviations a treatment condition has outperformed or underperformed a control condition. All of the effect sizes in the analyses are then averaged to produce a mean effect size for the treatment condition. For example, the average effect size for advance and graphic organisers is.20 which translates into a raw score of 58 per cent. The positive value of this mean effect size (.20) indicates that the presence of advance and graphic organisers has a beneficial impact on learning in comparison with their absence from such instructional situations.

Content presentation strategies: These include advance and graphic organisers, objectives and instructional illustrations and they comprise the most commonly adopted strategies in DE settings. Their primary role is to help the presentation and organisation of subject matter. Their influence on learning achievement, as shown by their effect sizes reported alongside, is rather small.

Activation strategies: These include student participation, reading and study skills training, in-text questioning and upgraded homework. These are strategies and arrangements that are provided by the designer or the instructor and are intended to help initiate and sustain learning activity. They are less commonly applied in DE settings and with varying degrees of intensity. The effect sizes for some of them are reportedly quite high.

Social support strategies: These include co-operative learning and peer group influence (institutionalised attempts only). Normally these are difficult and expensive to arrange, and their effect sizes have been varied.

Feedback and correction strategies: These include graded homework, generalised forms of feedback, corrective feedback in the context of mastery

learning, and one-to-one tutoring. These strategies are concerned with assessing and evaluating learner performance. Although these strategies have influenced achievement substantially, they are the least commonly applied instructional strategies in DE settings.

A Conceptual Framework

The remainder of this paper is devoted to the application of the above conceptual framework to the development of instruction. This is achieved with the translation of the framework into an 'instructional transaction'. The term, instructional transaction, was first coined by Merrill, Li and Jones (1992, 1993) to refer to 'patterns of learner-instructor interactions far more complex than a single response of display which are designed to enable the learner to acquire a certain kind of knowledge or skill'. In this paper, the term, instructional transaction, refers to a complete instructional event comprising the presentation of instructional stimuli, elicitation of response(s) from learners, assessment of that response or responses, provision of feedback and remediation, and evaluation of the impact of that instructional event.

The event is constructed using the following five steps. These are presentation of instructional content or subject matter, activation of student learning, assessment of learning outcomes, provision of feedback and remediation, and evaluation of the impact of the instructional event. Seen as a single act these five steps in the event comprise an instructional transaction.

The building blocks of the instructional transaction presented derived from existing research as well as accumulated wisdom on the processes of teaching and learning. To a large extent, it may seem that the transaction will unfold in a linear manner. This means the presentation of content is followed by activation of learning, which, in turn, is followed by assessment of learning outcomes and so on.

In reality though, the transaction cannot, and should not, be entirely linearly implemented. The activation of learning, for instance, is closely related to the strategies that are applied in the presentation of content. Similarly, the choice of assessment strategies is closely tied to strategies that have been used to present content and activate learning. In the same manner, outcomes of the evaluation exercise will affect all stages of the instructional transaction. As such then, the five stages in the instructional transaction are not only to be seen but utilised as a singular composite instructional event.

As shown in the transaction, an instructor's choice of strategies for presenting content, or activating student learning, or assessing learning outcomes, *etc.,* is determined by particular theoretical perspectives the instructor may hold on that step of the transaction. For example, an instructor may choose to approach the activation of the learning task from one or more, or indeed a combination of theoretical perspectives on learning. These may be a behavioural orientation, or a constructivist one, or a situated cognitive perspective. Another factor that may influence one's choice and use of particular strategies for each step in the

transaction is the nature of the instructional content. It seems that certain kinds of content are better presented with certain strategies as opposed to others. Conceptual content, for instance, is better presented using a general-to-detail or simple-to-complex sequencing format while factual information lends itself to instructional algorithms and flowcharting.

A third factor that will influence one's choice of strategy at each step of the instructional transaction is the culture and ecology of the learning context. This includes the delivery mode, learner characteristics, and issues like motivation, co-operation and competition that are likely to require differential types and kinds of attention from one context to the other.

The following sections of this paper will engage in some discussion of the dynamics of each step of the instructional transaction.

Content Presentation

This refers to the presentation of instructional content (*i.e.*, subject matter) to the learner using particular mode, media and strategies for structuring and presenting content. Choice of media, that is, whether to use print or non-print technologies, audio-video technology or multimedia systems will to some extent depend on the delivery mode. Mode of delivery here refers to whether one is engaged in open learning, distance education, face-to-face, or in a mixed-mode system. Costs of media and the logistics of implementation will also impact upon adoption or non-adoption of particular media. Choice of strategies for structuring and presenting content, on the other hand, will be determined mostly by nature of the content and, as explained earlier, a range of strategies might be applied depending on whether the content is conceptual, procedural or factual in nature.

Activation of learning

The presentation of instructional content must be followed with the activation of learning and the enhancement of learning capability. This involves selective use of instructional and learning strategies to advance learning, enhance learning capability and to compensate for any deficiencies there might be. As mentioned earlier, choice of these strategies will be determined not only by the theoretical perspectives one might hold on effective learning, but also, learner characteristics and the type of content or skill that is being learned.

The strategies selected may be instructor initiated or generated by the learner. Strategies that are instructor initiated are considered as 'mathemagenic' in nature, since they are designed to enable learners to acquire knowledge about the content or skill that is being delivered. This view is grounded in the belief that there is an objective reality or knowledge that learners can and do assimilate in their cognitive schema. Learners are not encouraged to make their own interpretations of what they perceive. Instead, it is the role of the instructor to interpret events and concepts for learners.

The alternative view is more learner centred arguing that reality is in the mind of the knower and that learners construct a reality based upon their own

perceptions (Jonassen, 1991; Duffy and Jonassen, 1991). Strategies with this orientation are considered as being 'generative' in nature. Their emphasis is on how learners construct knowledge based upon their prior knowledge, mental structures and belief systems. This perspective, however, does not preclude the existence of objective knowledge or external reality. It simply claims that learners construct their own reality through interpretation of objective knowledge (Cognition and Technology Group, 1991).

Allied with the notion of generative processing are the concepts of constructivism and situation cognition. The concept of situated cognition is grounded in the belief that learning is most efficient and effective when it takes place within the context of realistic settings (Brown, Collins and Duguid, 1989). The roots of situated learning are grounded in constructivist philosophy and traceable to the concepts of experiential learning, and problem-based learning (Köhler, 1925; Koffka, 1935).

Constructivists will argue that various forms of knowledge, including knowledge of strategic procedures, are applied more generally if these are constructed by learners than if explicitly taught to them. Moreover, that the construction of meaning leads to ownership. They will argue that, whenever possible, instructors should structure situations so that learners discover knowledge (*i.e.*, facts, procedures and principles) for themselves, as opposed to being told or given it.

Using what Brown et al. call 'authentic tasks', situated learning enables students to immerse themselves in the culture of the subject matter, much like an apprentice carpenter is immersed on the building site with the master builder. Learning experiences are designed to engage learners into 'cognitive apprenticeships', which immerse them in the total culture or ecology of the subject matter that is being studied.

4

Teaching Technology

DE serves as an alternative method for delivering academic coursework to students unable to attend traditional campus-based classes.

Mielke's discussion includes the following:

- *Definition*: DE is a method of education in which the learner is physically separated from the teacher and the institution sponsoring the instruction. Originally, DE involved teachers traveling to remote sites to teach classes or teachers corresponding with students. Technology has raised the quality of individualized distance instruction.
- *Forms of DE*: There are video and audio models of DE that involve broadcast and cable television, satellites, microwaves, fibre optics, and audio graphics. The linking of computer technology via the Internet or CD-ROM with television transmission provides a new dimension to DE, and can link professors to students in a distance setting. Another form of interaction is the use of computer conferencing. This method utilizes asynchronous communication in such forms as an e-mail list group, an Internet discussion group, or other types of conferencing software.
- *Adaptability*: Traditional programmes that are heavily based in skill development and demonstration or require laboratory work can be offered in a DE format using interactive video interfaced with computers to facilitate a hands-on learning approach. Classes that use lectures and laboratory experiences are easily adapted to a DE situation.

- *Effective teaching and learning with DE*: DE dictates changes in behaviour for both the teacher and the learner; successful students develop persistence and skills in self-directing work. Critical elements for successful distance teaching are:
  - Instructor enthusiasm (comfort in front of the camera or with the technology);
  - Organization (teaching materials must be prepared in advance);
  - Strong commitment to student interaction;
  - Familiarity with the technology used in the class format; and
  - Critical support personnel (production staff, graphic designers, and technical staff members).

Educational Principles and Technology

Driscoll discuses four principles that offer a framework to teachers for thinking about how technology can support teaching:

1. Learning *occurs* in context, including the ways technology can facilitate learning by providing real world contexts that engage learners in solving complex problems, and computer simulations and computer-based micro worlds that offer contexts for learners to explore and understand complex phenomena in a variety of subject areas;
2. Learning is *active*, including the use of brainstorming, concept mapping, or visualization software, as well as simulations that enable learners to experiment with modeling complex ideas;
3. Learning is *social*, including software that supports a networked, multimedia environment in which students collaborate on learning activities; and
4. Learning is *reflective*, including technologies that promote communication within and outside the classroom, making it easier for feedback, reflection, and revision to occur.

Multicultural Education and Technology

In recent years, multicultural education and technology have emerged as key issues in education. Marshall describes how technology can support multicultural education efforts based on the five critical dimensions of multicultural education:

1. Content integration is intended to expand the curriculum by incorporating contributions of diverse cultures into traditional disciplines of study;
2. Knowledge construction promotes critical literacy by making explicit the manners in which scholars contribute to their respective fields of study;

3. Prejudice reduction is about eliminating all forms of bigotry and involves promoting healthy personal identity devoid of the tendency to need to denigrate people who are different;
4. Equity pedagogy is about equalizing opportunities to learn, involving incorporating various strategies that attend to learning styles and intelligence types; and
5. DE (*i.e.*, everyone has access to specific courses or programmes) is one example of empowering school cultures and social structures.

Therefore, teachers at all levels accept that technology has become an integral aspect of the teaching-learning process, but it is too soon to crown the duo a perfect pair.

TECHNICAL TEACHERS TRAINING

Even though often less acknowledged, the importance of a good teacher is enormous in India. They play a vital role in the overall development of the students. Not only are they responsible for imparting academic knowledge, but are also responsible for inculcating the right values and principles to their students. The importance of teachers is especially enormous during the formative years of children when they first join school. Therefore it is very important to have professionally qualified teachers to ensure the right development of students. At present there are several colleges and institutes offering Teacher's Training Courses in India. Since the needs of the primary students are different from the secondary students, the primary teachers and secondary teachers are required to take up different teacher's training courses. Therefore there are different teacher's training institutes offering:

- Basic training certificate (BTC)
- Junior basic training (JBT)
- Nursery Teacher's Training (NTT)
- Diploma in Education (D.Ed),
- Primary teachers training (PTT),
- Bachelor in Education (B.Ed)
- Other teachers's training courses.

Basic Training Certificate (BTC)

The quality of the education system plays a major role in the development of the country as it builds up the human resource of the future. But the sustenance of a vibrant educational system depends to a large extent on the quality of teaching at the elementary level. In order to improve the quality of the teachers, the government of India has set up various institutes that provide Basic Training Certificate (BTC) after the successful completion of a course in teacher's training. The institutes providing Basic Training Certificate (BTC) courses are

set up in almost all the states in India so that maximum number of teachers can avail the training and help improve the quality of education in India. The basic training certificate courses in the field of education are increasingly becoming popular as recruitment boards of primary teachers in various Indian states regard the BTC as a part of the minimum eligibility criteria for appointment of primary teachers.

There are several institutes that offer Basic Training Certificate (BTC) Courses in India for teaching at the elementary stage. On completion of the Basic Training Certificate (BTC) Courses from an institute in India, one can apply to various primary schools.

Junior Basic Training in Education

The concept of JBT-Junior Basic training in India is a result of the realization that education received at the elementary level shapes the human personality in more ways than one. It is therefore in the interest of the students that they be taught by trained teachers who can develop the cognitive skills and also take care of the emotional needs of the students. The junior basic training Institutes (JBT) have come up in India mainly to train the teachers who are actively engaged in imparting education to the tender aged children.

Eligibility and Admission Criteria for JBT-Junior Basic Training in India

In some of the states in India the JBT or Junior Basic Training course is conducted for a period of two years. Entrance test is also conducted for the admission of students to this course. Apart from the government institutes there are quite a number of private institutes that conduct junior basic training courses in India. A certain number of seats are also kept reserved as per the rules and regulations mentioned by the government.

Students who have passed their 12th standard board examination or equivalent are eligible for taking admission in this course. In some of the states in India a minimum percentage of 50% marks in 10+2 examination is essential for the students willing to join this course. Candidates with a bachelor's degree seeking admission to this course should have a minimum percentage of 45% marks. Candidates should be between seventeen to twenty eight years of age. Five years maximum relaxation in the upper age limit is given to the reserved category candidates.

Junior Teacher's Training Certificate Courses

As schools bring together students from different sections of the society, training of teachers is very important so that they can take care of the differential needs of the students. Junior teacher's training certificate courses are designed to impart training to the teachers so that they can make the students confident enough to face the challenges of the future. Teachers trained through JTTC are expected to be actively engaged in the whole process of producing enlightened citizens of the country.

Elementary Teacher Education (ETE)

Elementary Education refers to the education imparted to children between the age group of 4 to 14 years. The education system in India is supposed to be the second largest and well-developed after America but in the rural areas, the number of drop-outs at the elementary level is quite high. The government, however, is taking steps to enhance the scenario and has been creating programmes that would make education easily accessible to everyone and also ensure that they continue with higher education. In order to strengthen elementary education in India it is also essential to provide proper training to the teachers entrusted with the duty of educating the students. There are quite a number of institutes that conduct elementary teacher education (ETE) in India.

Elementary level education lays the foundation of learning in a child. It is, thus, very important that teachers acquire proper training in order to handle children at the elementary level. The course includes all the major aspects of the field of study.

Apart from the theory part, teachers also go through practical training courses. However, candidates willing to pursue an elementary teacher education course in India need to fulfil the admission criteria as mentioned by the respective institutes. Candidates who have qualified their 10+2 examination or equivalent from a recognized board with the minimum percentage of marks are eligible for admission to this course. The growing need for trained teachers for the proper functioning of the schools have compelled private institutions to start various courses in elementary teacher education in India.

Primary Teacher's Training (PTT)

Well-trained teachers are capable of improving not only the quality of education in India but also the quality of life as they are actively engaged in building the human resource of the future. Primary Teacher's training is even more important as elementary education plays a very important role in a person's life. As they need to take care of the emotional needs along with developing the cognitive skills of the students primary Teacher's training is regarded as essential. Because of theses reasons Primary Teacher's training (PTT) is made compulsory in various states for appointment as primary teachers.

On this page we have tried to cover the institutes in India that offer the Primary Teacher's Training (PTT) courses.

We have tried to provide as accurate information as possible while compiling this list of PTT institutes in India. However, if you come across any discrepancy or error, do write to us about it. We would welcome any kind of feedback that will improve the quality of this page-a page that concentrates on providing the best information on PTT institutes in India.

Diploma in Education

As elementary education plays a very important role in a person's life and also in the development of the nation, the need to train the teachers is increasingly

been realized. In India there are different institutes that provide Diploma in Education, D.Ed. This diploma in education would help the teachers in developing their cognitive skills and also in taking care of the psychological needs of the students. The D.Ed-Diploma in Education, India is gaining popularity as various states have made it compulsory to have D.Ed to be eligible for appointment as teachers. Many institutions offering D.Ed-Diploma in Education in India Teacher training in India is offered through a number of institutions across the country. The various institutions offering D.Ed-Diploma in Education, India include the following:

- Adarsh Junior College of Education, Maharashtra
- Adhyapak Vidyalaya, Junior College of Education, Mumbai
- Basic Training Institute, Raipur, Madhya Pradesh
- District Institute of Education & Training, Ambala, Haryana
- Hindu College Of Education, Haryana
- Padmashree Academy for Creative Teaching, Bangalore.

Qualification: For admissions to the D.Ed-Diploma in Education at various institutes in India, the minimum qualification required is completion of 12 years of basic education. Also 50% is the minimum marks required in the qualifying examination to be eligible for Diploma in Education.

Bachelor of Education, B.Ed

Teachers play a very important role in a student's life. It is, to a great extent, the teachers who decide the shape a student's life will take. So, it is very necessary to be adequately equipped with resources that will make the teacher a perfect role model to the students. To achieve this, Bachelor of Education or B. Ed was introduced, which will teach a person about teaching and the various aspects associated with teaching.

Once a person completes the Bachelor of Education (B. Ed) coaching or training, then he is awarded with a B. Ed degree.

There are some important reasons as to why one should opt for B. Ed course. After training one becomes efficient in teaching subjects of his specialization on the basis of accepted principles of learning and teaching. The course develops skills and widens understanding so that one can impart quality education to his students.

The course also teaches about the attitude and makes him skilled in coming up with innovative teaching techniques. One becomes more competent in understanding psychological principles of growth and development and individual differences of the students he teaches.

There is a separate section in this course where the candidate learns to guide the children and counsel them in solving their personal and academic problems.

Top B.Ed colleges in India: If anyone is willing to have a strong foundation of teaching, it is always prudent to seek admission in some of the reputed B. Ed colleges in India.

Among them are:

- Jamia Millia Islamia, Maulana Mohammed Ali Jauhar Marg, New Delhi
- A.G. Teachers College, Ahmedabad
- Himachal Pradesh University, Department Of Education, Shimla
- D.M.College of Teacher Education, Imphal
- Andhra University, Visakhapatanam
- University of Bombay
- St. Xaviers College of Education, Patna
- College Of Teacher Education, Kozhikode
- NSS Training College, Pandalam.

Indian Universities offering B.Ed course Correspondence courses: Besides the above mentioned colleges, there are some universities which offer integrated course on Bachelor of Education.

- Annamalai University
- Bangalore University
- Jamia Millia Islamia Institure of Post Graduate Studies and Research
- University of Kerala, Institute of Distance Education
- University of Madras
- Maharishi Dayananad University
- Mother Teresa Women's University
- Patna University
- SNDT Women's University.

The demand for qualified and trained teachers all over the country has made the students choose B. Ed to ensure a good teaching job.

M.Ed (Master of Education)

As the education sector is attracting adequate attention in the age of structural adjustment and economic reform, Master of education (M.Ed.) is increasingly becoming a preferred career course for many Indians. This has also helped in the growth of the M.Ed. Career Colleges in India. The M.Ed Courses in India are generally pursued after the successful completion of the Bachelor of Education (http://www.indiaedu.com/b-ed-colleges/index.html) (B.Ed.) courses. It is a Post Graduate degree course offered at most of the District Institute of Education & Training (DIET) centers across India. In India M.Ed (Master of Education) is mainly offered by institutions that are recognized by National Council of Teacher Education, New Delhi.

It is a government body in charge of improving and implementing teacher education programmes in the country. It is essential to pursue the M.Ed. courses if you are interested in pursing a teaching career. M.Ed. is considered an important course as it helps the students to learn the education systems and

patterns more profoundly and comparatively. In every state in India there are several institutions that offer Master of Education courses. The eligibility criterion for admission to this course is that candidates must pass their Bachelor of Education B.ED from a reputed institution in India.

Technical Teachers' Training Institute (TTTI)

Technical Teachers' Training Institute, Chennai is a resource institute established by the Government of India for quality improvement of technical education in our country and in the Southern region in particular. Technical Teachers' Training Institute, Chennai is a model human resource development Institute for planning, designing, developing, organizing and evaluating quality training programmes, research studies and learning packages for technical and vocational education, industry and community. The Institute strives continuously and vigorously to further enhance its sensitivity to environmental changes and reach greater heights of excellence through active collaboration with national and international agencies on Projects and Programmes aimed at quality improvement of technical education systems.

About TTTI

The Technical Teachers' Training Institute (TTTI), Chennai, was established in 1964 by the Government of India as a key catalyst institution for ensuring quality in technician education in South India comprising the states of Andhra Pradesh, Karnataka, Kerala and Tamilnadu and the Union territory of Pondicherry.

The mandate of the Institute is to take initiatives to offer need based HRD programmes through appropriate modes and develop curricula and instructional resources. It will also foster research and offer consultancy and extension services for the total development of polytechnics and other technical and vocational institutions, the Directorates managing these institutions, business, industry and service sectors and the community at large.

In carrying out these, the Institute will collaborate with national and international agencies interested in and/or deriving benefits from technical and vocational education including business, industry and service sectors. TTTI, Chennai an autonomous organisation has made substantial and significant contribution towards improving the quality of technical education in all its aspects. Though during the initial stages the emphasis was on training of teachers, over the years the emphasis has gradually changed to assisting the state governments and the polytechnics in the region towards improving their education process and products. This has led to diversification of the Institute's activities to suit the requirements of the clientele system.

Education Used in Today's Context

First, it is necessary to divest ourselves of the notion that ET means mass media or computers; no programme that is only equipment-driven works well.

Our institutions have become the graveyards of a lot of useless equipment. We cannot afford to be as wasteful as we have been in the past, nor can we spend money on equipment without considering whether what we are buying is appropriate for the task at hand and whether the necessary support systems can be quickly set up.

We must also realise that knowledge springs from many sources, and that whatever is of importance in the learner's environment and suitable for his/her needs is what we must find and use in any teaching-learning system by employing effective instructional designs. Here considerable experimentation is necessary, and appropriate technologies for these designs will have to be worked out. The primary goal has to be an educational one. And to reach it, it might be necessary to tackle it by breaking it down into specific educational objectives. The same problem may exist in different localities and cultures.

The systems that ET specialists would have to think about would therefore have to be diverse. Efficient teaching-learning systems at every level, which use available resources and appropriate technologies and processes, and which are flexible enough to effect changes based on observations and evaluations, are the need of the hour.

Further, one should stop looking at knowledge as a packet to be delivered, and instead take up topics, at least at the earlier stages of the educational system, that are relevant to the child in his/her environment and let both teachers and children build a teaching-learning programme that is multidisciplinary. The saying of Jesus, "There are many mansions in my Father's house," is true in the case of ET systems as well.

The vast numbers of children who need to be brought under educational systems pose a problem of scalability. Here the new technologies and the mass media can help, but they must be woven into the system in such a manner that they give good results. Interactive rather than disseminative programmes are desirable.

This expertise needs to be built up. The Internet and the Web provide sources other than local ones. But it is necessary to inculcate media awareness in our children so that they do not replace the words of tradition by the mantras of advertisers. They must know that nothing is value-free.

The major responsibility for bringing about this change falls on the shoulders of teachers. The discipline of ET is an enabling discipline designed to make the teaching of any subject more efficient and effective to meet the goals for which the subject is being taught. ET is not a subject in any syllabus except in teacher-training institutions. Information with respect to the ET needs of the curriculum have been passed on to the Focus Group on Teacher Education. Networking of teacher-training institutions and universities that offer ET courses is necessary.

Building alternative systems of education in addition to schools is the need of the hour. Whatever alternative systems exist on the ground need to be made less bureaucratic in their operations, and they should also be reoriented to carry out their tasks more efficiently. Alternative models of education, distance and

open-learning models, on-demand education, and similar flexible models of learning will have to be tried and established. Flexible systems, futuristic curricula, and a twenty-first-century career orientation have become necessary for young people today. Conventional definitions of livelihood options are too limited to cater to such a large number of people.

The ET Focus Group's Proposals for Action

What are the things on which we could leverage? A vast number of institutions exist with ET components in one form or another—CIET, SIETs, state ET cells, SCERTs (State Councils of Educational Research and Training), and more than 450 District Institutes of Education and Training (DIETs).

Further, even in higher education, where it is recommended that teacher training in ET should form a part of their programme, there are media units. Under the University Grants Commission's (UGC's) Consortium of Educational Communication, we have a network of over 17 Educational Media Research Centre (EMRCs) and Audio Visual Research Centres (AVRCs). More that 250 universities offer ET as an optional subject in B.Ed.and M.Ed. courses.

Technical Teachers Training Institutes (TTTIs) also have facilities for technical education. Several state open schools, the National Institute of Open Schooling (NIOS), several state open universities, the national open university, Indira Gandhi National Open University (IGNOU), and the distance education departments of conventional universities all have facilities to provide learning through alternative modes. However, all of them suffer from authoritative and exclusionary traditions. They must learn to collaborate, share, and revitalize themselves in order to meet the educational challenges that the future will bring. The Focus Group proposes that serious thought should be given to making these institutions more effective and to gear them towards the need of providing equitable and highquality education with access to all.

Reusing Programmes for Interactivity

Many organizations like CIET, SIETs, AVRCs, and EMRCs as well as many institutions like the Tata Institute of Social Sciences (TISS), for instance, have made some excellent programmes. The numbers game in which organizations like SIETs are caught up prevents them from reusing their old programmes or the programmes of other institutions. One of the most effective SIET has been Balchitravani in Maharashtra. It has a stock of nearly 3,000 programmes, many of which are of good quality.

Starved of funds, it has been raising money by the sale of its programmes. It has made a profit of about ₹ 90 lakhs. Some of its programmes like "Get to know your trees" could easily be dubbed into different languages and used. The reorientation of such institutions, and bringing them under one network, is highly desirable. Many of the Balchitravani programmes need to be digitalized; otherwise they will be lost. The reorientation and strengthening of these institutions cannot happen if action is not taken on a war footing.

Information Collection

There is as yet no aggregating function assigned to any institution either for programming or collecting data in respect of innovations, or an assessment of their worth. Many institutions—whether at the district level, or the state level, or the central level— could consider taking on this role. Programming for built-in interactivity is the need of the hour.

Using Satellites, DTH, and other Technologies

Another technology worth exploring is the use of satellites. India is perhaps the only country with a satellite completely dedicated to education, the EDUSAT. The present configuration of its structure is at variance with its declared aim of reaching backward areas and marginalized populations.

Nevertheless, it does free educationists from the dictates of Prasar Bharati, which, on the one hand, declares itself as a social service, but, on the other hand, demands money from educational programmers as if they are advertisers of commercial products. EDUSAT has a limited capacity for interactivity, but it would enable a new type of programming that is better than disseminative programming. Developing interactive skills and programming could be a valuable programme for ET, for which a great deal of R&D would be necessary.

It is desirable to explore whether an educational channel that uses the DTH (direct to home) technology of Doordarshan might not be a better proposition since it costs only ₹ 3,000 to install a dish antenna. It provides all the DD channels. DTH technology will have transmission capabilities both for Doordarshan (video) and AIR (audio) channels. These channels can become available anywhere in India.

DTH also provides a number of free-to-air foreign channels similar to those offered by the BBC. This possibility should also be explored as a number of good documentaries on various subjects are available both in the public and private domains and could be shown on documentary or educational channels like the Discovery Channel.

Other resources that we have on the ground are a well-established publishing industry, desktop publishing, and know-how and capabilities in producing kits, teaching aids, *etc.* We have production capabilities for audio and video, multimedia, broadcast channels, Internet connectivity, trained manpower, and institutions with responsibilities to undertake the tasks.

If only we could start using these resources in efficient teaching-learning systems, we could achieve a great deal and show the way forward in providing large-scale access to all parts of children, even those out of school, and the disabled.

Specific Proposals for the School System

A paradigm shift has to be made regarding the notion of the teacher's role. She has to move from being a "teacher" to being a facilitator or guide. This means an emphasis on the learning culture rather than on the use of technology.

One of the key concepts that should be kept in mind here is flexibility, as the appropriate use of facilities and the achievement of growth would be impossible without it. We need to pay special attention to the continuing education of in-service teachers. Here are the suggestions that arose during the discussions:

Revitalising and Reorienting Existing Resources

- At the risk of repeating ourselves, the Focus Group feels that it must emphasise that, while the macro attempts of the disseminative media have had limited effects, they have nevertheless led to the establishment of a large number of institutions and facilities, the founding of nationwide networks, and the emergence of trained professional and creative manpower in the area of ET. The challenge before us is to work out appropriate modes of re-engineering so that they can constitute a powerful and effective system.
- These institutions will have to play fresh roles. Apart from their role in producing audio and video materials, they will also have to be oriented towards action research, documentation, and assessment of innovative practices; undertake the in-service training of teachers; network with nationwide efforts in education and evaluation research; develop models for interactive classes, interactive multimedia, teleconferencing, and video conferencing; and lead the process whereby materials can be generated by teachers, parents, and children at every level.
- In recent years, ICT and the Internet have emerged as dependable media of interaction. Unlike the broadcast media, the Internet can facilitate the participation of the periphery in an eminently democratic discourse, which can be empowering. And if properly deployed, quality concerns hitherto forced by economic and power considerations to be confined to the haves can now be within the reach of everyone. The need of the hour is, therefore, to recognise this potential, promote universal access, facilitate participatory forums, and develop communities and interest groups. Left to market forces alone, the reach is bound to remain limited. The Internet can be a sound investment for continuous on-demand teacher training and support, research and content repositories, value-added distance education, and online campuses aimed at increasing the access, equity, and quality of education.
- The model of education prevalent today presumes the existence of groups endowed with abilities, knowledge, and skills, which at times even subsume the right values, and which therefore acquire the mandate to educate. This separation of the centre and the periphery

has led to the alienation and disempowerment of large communities of people. The fact that we continue to invest in adult education, that we continue to grapple with the problem of dropouts, that we continue to deal with issues relating to the provision of even minimum facilities can be traced largely to this chasm. Both for logical reasons and as a moral compulsion, it has become necessary to strengthen multiple, albeit shifting, centres. The challenge of population alluded to earlier can only be met if we overcome this centre dominant thinking.

- The other implication of this idea is that knowledge is not centred at any powerful location, but is available everywhere. What constitutes education is an opportunity for every individual to develop his or her latent abilities and skills, to choose his or her teachers, and to benefit from select experiences. The problems of certification and standardisation, recognition of what constitutes legitimate knowledge, deciding who is a legitimate teacher, and determining what abilities, knowledge, and skills constitute legitimate education may all have to be looked at from drastically different perspectives.

In Systemic Reforms

- Ensure that technology is used in an equitable and democratic manner to enhance the selfworth and self-image of the poor and the disadvantaged.
- Counter the tendency to centralise; promote plurality and diversity.
- Ensure opportunities for autonomous content generation by diverse communities.
- Shift focus from fixed to flexible curricula with competencies and skills identified rather than specific factual content.
- Deploy ET to enhance open education, which implies openness in curriculum transactions.
- Work towards transforming all schools into ICT-rich environments.
- Create opportunities for administrators and educational leaders in the school system to become ET savvy and to be able to use ICTs competently.

In refreshing the Skills of In-service Teachers

- Create a system of lifelong professional development and support, especially of educational leaders and managers such as headmasters and principals.

- Encourage ICT literacy for official and personal use to increase comfort and later enhance creativity in educational work.
- Support the development of and nurture teachers' self-help groups/ professional development groups on the ground as well as online.

In Pre-service Teacher Education

- Introduce teachers to flexible models of reaching curriculum goals.
- Introduce use of media and technology enabled methods of learning, making it inherent and embedded in the teaching-learning process of teachers.
- Train teachers to evaluate and integrate available materials into the learning process.
- Enable trainee teachers to access sources of knowledge and to create knowledge.

The foremost challenge is to put in place a system of lifelong professional development and support. This has to replace the one-shot touch-and-go interaction, loaded with theory and almost no practice, into which the present teacher-preparation programmes have degenerated.

Even while we set out to accomplish this goal, revamping the ET component of the course requires immediate attention. As long as ET is used in isolation from the other components related to teaching learning, it will fail to convince a teacher about the significance of her role in engineering the teaching-learning situation and the importance of making it a more meaningful experience for both herself and her pupils.

In School Education

Move from a predetermined set of outcomes and skill sets to one that enables students to develop explanatory reasoning and other higher-order skills:

- Enable students to access sources of knowledge, interpret them, and create knowledge rather than be passive users.
- Promote flexible models of curriculum transaction.
- Promote individual learning styles.
- Encourage use of flexible curriculum content, at least in primary education, and flexible models of evaluation.

Even within the confines of conventional schooling, helping children reach school and stay with it for a longer time will need to be addressed differently. Insights gained from various experiments aimed at reforming the school environment point towards the need for reform both in the system and within the classroom. ET will have a significant role to play here.

In Research

- Create a framework to identify the generic skills needed for the new initiatives to be undertaken in ET.
- Acquire knowledge about how learning takes place in ICT-rich learning environments, optimising learning paths for learners with different learning styles coming from a variety of social backgrounds, including gender differences. Examine possibilities of adopting mobile technologies for learning purposes.

TECHNIQUES OF COUNSELLING

The techniques used by the counselling should be according to the pupil's uniqueness and personality. Williamson has described the techniques of counselling under the following five headings—

Cultivating Self-understanding

The pupil or the client should possess the knowledge and understanding of his own abilities and responsibilities very clearly. The client should understand all these before using these abilities and responsibilities.

Therefore, the counsellor should have the experience of test-administration and interpretation of the test scores. The test scores provide a strong base for diagnosis and prognosis in the counselling process.

Advising and Planning a Programme of Action

The counsellor starts with the client's objectives and his attitudes, *etc.* and indicates favourable and unfavourable facts or data. He weighs the evidences and he understands the fact why he is giving special suggestion to the pupil. Williamson believes that the counsellor should state his attitude with definiteness. He should not look like an indecisive. The counsellor does not fear while giving advice or direct suggestion because the pupil does not understand the utility of scores.

Williamson has explained the following methods of advising the pupil after gathering the data:

(i) Direct Advising-In this, the counsellor gives his advice very frankly. This type of method is appropriate for tough-millded people who oppose any activity and who do not fear of failure.

(ii) Persuasive Method - This method is useful when the data indicate clearly some definite alternate. The counsellor analyses only the evidences and observes the alternate actions.

Establishing Rapport

When a client visits the counsellor for the first time, the counsellor should welcome his client. He should make him comfortable and he should be taken

into confidence. The main basis of establishing rapport is-the fame of the counsellor's ability, respect for individuality, confidence before the interview and developing relations with the pupil.

Referral to Other Personnel Workers

No counsellor can solve all types of problems of the pupils. He should recognize his limitations and he should be given the knowledge of sources of specialized help. He should suggest the pupils to seek the assistance from other sources.

In addition to above mentioned techniques, there are other counselling techniques which are as follows:

Silence: Sometimes, silent-listening proves more effective in different situations. When a client is describing his problem, the counsellor adopts silence. This ensures the client about the counsellor's full attention towards the client's narration. It also ensures the client about the counsellor's serious thinking on the client's problem.

Acceptance: The counsellor should grant temporary acceptance to the client's case. Sometimes, the counsellor utters such words which give the impression that he understands very clearly whatever the client is stating. But the counsellor utters the words in such way that the client's talk remains un-interrupted for example, 'alright' 'very good', 'yes', *etc.* At many occasions, the counsellor does not utter any word for his acceptance! but he nods expressing his acceptance.

Clarification: At some occasions, the counsellor should clarify what the client says. It is the duty of the counsellor to make the client familiar with the fact that he understands the client and he accepts him. But sometimes it becomes necessary to clarify the client's explanation. While clarifying, the client should not feel any compulsion.

Restatement: Acceptance and restatement both ensure this client that the counsellor understands and accepts him. Through restatement, the counsellor repeats what the client has stated. But the Counsellor does not apply any correction or clarification during the client's assessment while restating, at his own.

Asking Questions: The counsellor should ask some questions to inspire the client to express more ideas. These questions should be asked just after the client's statement is over.

Approval: The client, expresses his different views regarding his problems. The counsellor approves some of them and disapproves others. The ideas which are approved affect the client very much. The client is also influenced by the knowledge possessed by the counsellor and his personality. If the counsellor 'grants approval to the client's ideas intermittently, then the approval becomes ineffective. Attention should be paid towards this.

Humour: Use of humour just to remove the client's tension and to make the conversation interesting has become the necessity of the day.

Summary Classification: Some part of the client's statement may not be useful Hence, the problem looks vague in itself In such situation, it becomes

necessary for the counsellor to shorten the client's statement and to organize it properly so that the client may understand the problem more distinctly. The counsellor should always try not to add his own ideas.

Analysis: The counsellor can take initiative by presenting some solution to the client's problem. But the counsellor cannot force the client to act upon that solution. He leaves it upto the client whether to accept or reject that solution or to apply some modification. The client cannot be put under pressure in this regard.

Interpretations: The counsellor should have the right to interpret the client's statement or explanation only. He should not add from his own side. He concludes the result out of client's statement. The client alone is unable to derive results. It is important to note here that the results concluded by the counsellor and results derived" from the tests may agree or may not agree.

Regression: Sometimes it is erroneous whatever the client thinks or speaks. Such faulty ideas should be given up. The counsellor should act very carefully In order to give up such ideas so that the client may not turn agitated and the client may not think otherwise in negative sense.

Assurance: The technique of providing assurance to the client develops optimism in the client regarding the solution of his problem. Through assurance the counsellor approves the statements of the client and also provides support along with approval.

Effects of assurance are equally observed. Assurance is considered more comprehensive than the approval. Hence, the approval is included in the assurance.

Explanatory Method

Explanatory method is the most desirable method in the counselling. In this, the counsellor gradually understands very carefully the diagnostic data and indicates those situations in which the pupil's potentialities can be used. In this, the, use of data are explained in detail and carefully. Then after knowing the decision or interest of the client, the counsellor helps directly in order to execute the decision. This help includes the remedial work, educational or teaching plans, *etc.*

EDUCATIONAL TECHNOLOGY AS SYSTEMS APPROACH

Educational Technology as a systems approach: All attempts made to define the concept of educational technology as an area of study involving the application of technologies emerged from the application of theories of learning and development as well as information and communication technologies have not been comprehensive enough without a theoretical grounding in the social context. The use of these technologies has to be grounded in a theoretical foundation provided by a systems perspective. The field of educational

technology shares the same difficulties and struggles involved in defining itself as one comes across while defining other social sciences and applied social sciences. This section attempts to provide you with adequate theoretical understanding about systems theory in order to have a more comprehensive view of the field of educational technology.

You would have read through the two sections indicated in the article by Luppicini (2005). You would have understood that a comprehensive definition of educational technology goes beyond uses of technology including techniques, theories, and methods from multiple knowledge domains which are standardised and reproducible such as computer science, psychology and communications. The definition would also include the governing principles of systems approach.

'The systems approach to educational technology The systems approach to the design and analysis of teaching/learning situations is the basis of the great majority of modern educational technology-related developments. However, the terms system and systems approach are themselves jargon terms that can have a variety of interpretations. Let us therefore take a look at these terms in order to define the way in which we are to use them.

In general systems theory, a system is any collection of interrelated parts that together constitute a larger whole. These component parts, or elements of the system are intimately linked with one another, either directly or indirectly, and any change in one or more elements may affect the overall performance of the system, either beneficially or adversely.

The Systems Approach in Technology Education

The traditional approach in engineering or technology teaching is bottom-up, *i.e.*, from component to system. For example, the order of the courses in a typical communications engineering programme is: mathematics (calculus, *etc.*), science (physics, *etc.*), electricity basics, components, linear circuits, modules, basics of transmission and receiving, subsystems, and communications systems. In most traditional curricula, both in high school and undergraduate programmes, the stage of dealing with a complete system is sometimes not fully addressed by the curriculum.

The larger, more complex, more dynamic and more interdisciplinary the specifications for a technological systems get, the harder it is for a lone engineer, as skilled as he or she may be, to design a complete system. Given this, students and their teachers, who are not required to be proficient in engineering, but who should be technologically literate, should not be expected to know so much as trained engineers as they go about manipulating entire technological systems.

Based on the systems thinking approach, what follows is a proposal for a way to teach technology and instill technological literacy without first teaching the details (for instance, electricity basics and linear circuits for electronics, or calculus and dynamics basics for mechanical engineering).

The central idea in this premise is that complete systems can be handled, conceptually and functionally, without needing to know their details. According

to this approach, when trying to develop technological literacy in students who are not required to be proficient in engineering, the favoured teaching strategy is top-down. In other words, the focus must be on the characteristics and functionality of whole systems and the interdependences of the subsystems.

System Approach

This new technology has influenced the educational administration and organisation to a great extent. This is the modern approach.

It acts as a link between hardware and software approach. It is also known as 'Management Technology'. It has brought to educational management a scientific approach for solving educational administrative problems.

It is essentially a new management approach, influencing management decisions in business, industry and education. Education is regard as a system and system approach is a systematic way of designing an effective and economical educational system.

System is defined in the dictionary as "an assemblage of objects united by some form of regular interaction or inter-dependence; as organic or organised whole as the solar system or a new telegraph system". System may be divided into three broad categories.

Systems Approach

System approach is a systematic attempt to coordinate all aspects of a problem towards specific objectives. Webster's dictionary defines a system as "a regularly interacting or independent group of items forming a unified whole." The characteristics of a system of may be explained with the help of an example – various parts of the digestive system may be called as components of digestive system. Every component of the digestive system contributes to as supports in functioning of the digestive system as a whole.

In the context of education, system is a unit as a whole incorporating all its aspects and parts, namely, pupils, teachers, curriculum, content and evaluation of instructional objectives. The teaching-learning process is viewed as communication and control taking place between the components of a system. In this case, the system is composed of a teacher, a student and a programme of instruction, all in a particular pattern of interaction.

The System Approach focuses first upon the learner and then course content, learning experiences and effective media and instructional strategies. Such a system incorporates within itself the capability of providing continuous self-correction and improvement. It is concerned with all elements of instruction including media, including hardware and software. Its purpose is to ensure that the components of the organic whole will be available with the proper characteristics at the proper time to contribute to the total system fulfilling the objectives.

In the systems approach to instruction, the teacher has to plan completely the utilization of selected resource material and the classroom activities. The

teacher should have a good overall view of the subject, know his/her limitations, know all about his/her pupils and the individual differences in their learning capacities and plan accordingly. The system approach involves continuous evaluation of learning outcomes and utilization of knowledge gained by analysis of results of evaluation to suitably modify the plan of approach to achieve the stated objectives.

Major steps in the systems approach in education are: 1. Formulating of specific instructional objectives to be achieved and defining instructional goals, 2. Deciding appropriate media to achieve these goals, 3. Defining learner characteristics and requirements, 4. Selecting appropriate methods suitable for effective learning to take place, 5. Selecting appropriate learning experiences from available alternatives, 6. Selecting appropriate materials and tools required, 7. Assigning appropriate personal roles for teachers, students and supporting staff, 8. Implementing the programme, 9. Evaluating the outcome in terms of original objectives measured in student performance and 10. Revising to improve efficiency of the system to improve students' learning.

Advantages of Systems Approach

i. Systems approach helps to identify the suitability of the resource material to achieve the specific goal.
ii. Technological advance could be used to provide integration of machines, media and people for attaining the defined goal.
iii. It helps to assess the resource needs, their sources and facilities in relation to quantities, time and other factors.
iv. It permits an orderly introduction of components demonstrated to be required for systems success in terms of student learning.
v. It avoids rigidity in plan of action as continuous evaluation affords desired beneficial changes to be made.

Limitations of Systems Approach

i. Resistance to change. Old ways are difficult to erase. There is always resistance to any new method or approach.
ii. Involves hard work. Systems approach requires hard and continuous work on the part of school personnel. Some are not prepared for the extra load.
iii. Lack of understanding. Teachers and administrators are still not familiar with systems approach. Though it has been successfully implemented industry, it has still to make headway in education.

5

Pedagogical Designs for E-learning

The main point of this stage is to explore issues surrounding the influence of media on learning, and to examine pedagogical designs for optimizing e-learning. The following are the key questions in relation to an exploration of these issues. Do media influence learning? Can we differentiate the unique influences of media on learning from the influences of instructional method? How can we optimize the influences of media on learning? Do we need different pedagogical designs for e-learning? If yes, then what are those designs that can optimize e-learning?

DO MEDIA INFLUENCE LEARNING

While it is clear that information and communications technology offers tremendous opportunities for capturing, storing, disseminating and communicating a wide variety of information, does it influence learning, and if it does, what is the nature and extent of that influence? These questions are at the heart of a longstanding debate and discussion on the influences of media on learning. The origins of this debate and discussion on the influences of media on learning date back to the invention of radio and television.

On developing a camera that used film rolls, Thomas Edison had expected that the motion picture would revolutionize education and make schooling a lot more attractive and motivating for students. Commentators of that time had suggested that instead of wanting to stay away from school, students would rush back to school and not want to leave school. While we know that this did not actually happen, the moving image did influence our ability to represent many things in many different ways, in and outside of school. Several decades

after Edison's inventions, and based on the growing influence of radio, television and other media on our lives, Marshall McLuhan claimed that the "medium is the message". With this aphorism, McLuhan was suggesting that each medium has characteristics and capabilities that have the potential to shape, direct and enhance our capabilities.

As such McLuhan saw media as "extensions of man" which is the subtitle of his classic book. The 1960s and 70s saw growing enthusiasm in the use of computers in education. This was naturally followed by similar interest in the impacts of computers on learning with many researchers concluding that while media may have some economic benefits, they did not show any benefits on learning.

Several leading researchers of the time argued that learning and any learning gain is actually caused by the way the subject matter content is presented via a medium, rather than the medium itself. A prominent contributor to this discussion on media research - Richard Clark - has in fact proclaimed that "media will never influence learning". He has in fact suggested that "media are mere vehicles that deliver instruction but do not influence student achievement any more than the truck that delivers our groceries causes changes in our nutrition". Clark concedes that media can have important influences on the cost and speed of learning, but argues that it is only the instructional method that can influence learning.

He defines instructional method as "the provision of cognitive processes or strategies that are necessary for learning but which students cannot or will not provide for themselves". Clark's argument is that media is replaceable and therefore "any teaching method can be delivered to students by many media or a variety of mixtures of media attributes with similar learning results". Based on this claim, he put forth a challenge for anyone to "find evidence, in well designed study, of any instance of a medium or media attributes that are not replaceable by a different set of media and attributes to achieve similar learning results for any given student and learning task". However, not everyone agrees with these suggestions and claims of Richard Clark.

One of these is Robert Kozma who is another prominent contributor to this discussion. Kozma reviewed relevant research on learning with media which suggests that the "capabilities of a particular medium, in conjunction with methods that take advantage of these capabilities, interact with and influence the ways learners represent and process information and may result in more or different learning when one medium is compared to another for certain learners and tasks".

The body of literature that Kozma reviewed supports a theoretical framework for learning which sees the learner as "actively collaborating with the medium to construct knowledge", where "learning is viewed as an active, constructive process whereby the learner strategically manages the available cognitive resources to create new knowledge by extracting information from the environment and integrating it with information already stored in memory". In

such educational settings, the medium is not inert and it does not exist independently of the learning context and the subject matter content. In fact, when it is carefully integrated into the learning experience, the medium often interacts with the instructional method to produce the intended learning outcomes for the students in a given learning context. Therefore the media used, along with the instructional method would seem to have an influence on learning. In such educational settings, it would be difficult to disentangle the discrete and unique influences of the media and the method on learning.

WHAT IS THE ROLE OF MEDIA IN LEARNING

Therefore, it is arguable that in most contemporary technology enhanced learning environments where media is skillfully integrated with the instructional method, media can and do play a very influential and critical role in learning and teaching. Some prominent examples of such educational environments are the Jasper Woodbury Series, and Exploring the Nardoo.

In these contexts, media play a critical and a very important role in achieving the intended learning outcomes for the students. They serve to motivate students with clever use of sound, pictures and animation. They are also very useful in representing contexts and situations from the real world which are harder to bring into the classroom for live demonstrations. The majority of these learning environments such as the Jasper Woodbury Series and Exploring the Nardoo are grounded in constructivist principles of learning, and situated cognition.

These learning environments skillfully utilize the strengths of various media attributes with powerful learning strategies such as problem solving, collaborative inquiry and critical reflection to engage learners in meaningful and motivating learning tasks. In such educational settings media take on a very important role in both learning and teaching. Learning and teaching is adversely affected when media are not skillfully integrated into the learning experiences. Conversely, learning and teaching is optimized when media have been carefully selected and applied with sound instructional strategies to serve specific learning needs in different domains of learning.

OPTIMIZING THE INFLUENCE OF MEDIA IN E-TEACHING AND E-LEARNING

Skillful integration of media and instructional method is critical in the optimization of the influence of media in learning. This has to do with careful selection and matching of media attributes with learning and teaching strategies. Contemporary information and communications technologies afford a wide range and variety of opportunities to re-think and re-engineer the nature of our teaching and learning practices.

A major part of this re-engineering process includes shifts in the roles of teachers from being providers and deliverers of subject matter content to becoming moderators and facilitators of learning within the context of a learner and learning-centred approach to education. Learner and learning-centredness

is regarded as a desirable trait in education and training generally. Learner and learning-centred educational environments are those where the learner and the learning process is the focus of programme design, development and delivery. In such educational settings, the learner—not the teacher, organization, or technology—is in charge of the learning experience.

Learner and learning-centred educational processes are defining characteristics of situated learning environments. The concept of situated learning is grounded in the principles of constructivist learning theory. It is based on the belief that learning is most efficient and effective when it takes place within the context of realistic educational settings which are either real or contrived. The roots of situated approaches to education and training are traceable to the concepts of experiential learning, and problem based learning.

Exemplar situated learning environments use "authentic learning tasks" to immerse learners in the total ecology and culture of the subject matter that is being taught and learned, much like an apprentice carpenter is immersed in a building site with architects and experienced builders. These so called authentic learning tasks serve to "anchor" learning and teaching activities in order to scaffold learning and cognition. The notions of situated learning and the use of authentic learning tasks that serve to anchor and scaffold learning and teaching are heavily dependent on the use of real-world or contrived educational activities that adequately reflect real-world settings. These sorts of educational activities are inherently complex and as such time-consuming to manage. They are harder to integrate into conventional classroom settings which are limited by the opportunities they afford to engage students in authentic realworld problem-solving.

While field trips and excursions offer occasional and limited opportunities, they are not enough. Therefore many teachers and organizations refrain from engaging in situated learning activities in their classes and instead depend on approaches that are a lot more expedient and teacher and subject matter centred. Contemporary information and communications technologies offer some reprieve from the confines and constraints of conventional classrooms. They afford us opportunities to capture and/or represent real-world scenarios for use by learners within the conventional classroom.

These representations can include actual images or simulations of complex phenomena from the field which can be a lot more easily integrated into the classroom curricula. They can be used as additional resources in lieu of actual field experience, or they can form a core component of the learning experience of students as is possible in the case of goalbased or problem-based learning, case-based reasoning or scenario-based learning. The rest of this stage discusses a number of these pedagogical designs for optimizing the influence of media on learning in this manner.

ONLINE LEARNING MANAGEMENT SYSTEMS

Online learning management systems are a suite of software tools that enable the management and facilitation of a range of learning and teaching activities

and services. In large-scale operations, online learning management systems can save costs and time. In conventional educational settings, online-learning management systems can help to improve the speed and effectiveness of the educational processes, communication among learners, and also staff and students. Use of LMSs in nontraditional educational settings allows organizations to maximize their value by enabling flexible access to its resources and services.

Most online learning management systems also incorporate a learning content management system, which is a set of software tools that enables the, storage, use and reuse of the subject matter content. Contemporary organizations recognize that the use of onlinelearning management systems have the potential to significantly improve their image and value, as well as access to their services. Recent studies conducted by industry analyst Brandon Hall suggest that there has been a steady rise in the use of LMS for education and training over last few years. Most LMSs will have the following features: course content delivery capabilities; management of online class transactions; tracking and reporting of learner progress; assessment of learning outcomes; reporting of achievement and completion of learning tasks; and student records management.

It is likely that the next generation of LMSs will have additional features such as better collaborative learning tools and better integration with other complementary systems, and with portable and wireless devices. It is also suggested that the next generation of LMSs is going to be increasingly browser-based and less reliant on umpteen downloads or plug-ins on the user's desktop. They will have to be easier-to-use, more robust, scalable and more easily customizable. With the growing interest in the sharing of study materials, they are also likely to comply more with industry standards and with complementary systems.

ADHERENCE TO EMERGING STANDARDS

Proprietary learning resources generally do not operate across different platforms, making them difficult and expensive to use easily. To enable learning objects to be reused and managed across various learning management systems, the online-learning industry has embarked on initiatives for the development of industry-wide standards and specifications. A widely known initiative in setting such industry-wide standards for the sharing of digital learning resources is SCORM. As these standards continue to push for wider recognition and adoption, developers of LMS and LCMS, and learning resources who comply with their specifications are going to strengthen user confidence.

LIMITATIONS OF CONTEMPORARY LMSS

to emulate, as best as possible, conventional classroom-based learning and teaching practices. In beginning with conventional classroom-based practices as the standard the developers of LMSs have continued to perpetuate the many pitfalls of these educational settings. This equates to a false start for LMSs, because developers have failed to capitalize on the critical attributes of LMS tools.

These include features such the flexibility it can afford, the variety of interaction it can support, and the type of study materials it can incorporate. Many contemporary LMSs tend to put learners in a rather passive role, where they can read large amounts of textual material, and engage in on-line discussions.

This does not offer much more than what is possible in a conventional classroom setting. Many of these LMSs lack the tools and capability to engage learners and teachers in the development of complex cognitive and social skills, such as those that involve collaboration, professional judgment and decision-making and where there are many potential solutions, and no single straightforward answers. There is no doubt that many of the contemporary LMSs provide excellent tools for managing learning throughout an organization, however, if not carefully used, they can actually lead to a degradation in the quality and effectiveness of learning. Many LMSs comprise templates for the creation of online course content. These tools help teachers design and create courses easily and quickly in a familiar environment without the need for much training. These built-in authoring tools are fine if one needs to quickly build an online-learning environment where discussion most contemporary LMSs tend to operate as "pageturning" online which consists of a typically linear sequence of screens containing chunks of information.

The level of user interactivity in this activity consists of simply clicking a button or hyperlink to proceed to the next screen. Although sometimes animations, audio, or video elements are added to these sequence of screens, the underlying model of the course that is built using these tools is very uninteresting and a rather poor substitute for conventional classroom-based practices. Another feature of LMSs, which is claimed as a key benefit, is their ability to track learning activities.

Most contemporary LMSs have the capability to collect, organize and report data on learners' activities. These may include data on time spent on a learning activity, when it was started and completed, and number of attempts at an assessment item. The main problem with this kind of tracking of the details of a learner's activities in an onlinelearning course eliminates a key benefit that this environment affords, which is the creation of a safe environment that frees students from the fear of failure and the pressure of time that is endemic of a conventional classroom.

It is possible that learners who know that every time they click something is being tracked and recorded, they are probably likely to feel less comfortable experimenting, taking chances, and pushing the limits of their knowledge. It is possible that instead of learning from their own mistakes, they will work to avoid making any mistakes at all.

THE PERFECT LMS IS STILL EVOLVING

As users become more knowledgeable and comfortable with the use of LMS, they are beginning to demand advanced features and functionality, including support for wireless devices, better collaborative learning tools, and better

content management capabilities. The next-generation of LMSs will have to have improved functionalities, customizability, flexibility, interoperability, and scalability. Moreover, as users move beyond the thrills and frills of the technology, they are also focusing attention on the educational functions of the tools. This augurs well for both the developers and novice users, as it signals the development of robust learning management systems that are guided by pedagogical considerations and not by what the developers or the tools can do.

SELECTING A LEARNING MANAGEMENT SYSTEM

Selecting the right online-learning management system and achieving a successful implementation is a large undertaking. This is particularly so for organizations which have historically relied on conventional classroom-based approaches to learning and teaching.

Evaluating the many associated issues that contribute to the acquisition of a comprehensive LMS and ensuring that the organizational infrastructure is able to support it is a major challenge. Foremost, the selection of an online learning management system needs to be an integral part of an overall strategic e-learning plan for the organization. A first step in the LMS decision-making process is to define the learning and teaching goals of an organization and how it seeks to pursue those goals. Being clear about the values and the goals that an organization seeks to promote in relation to learning and teaching will allow one to ascertain how closely an off-the-shelf LMS aligns with those values and goals.

The next step in the process is to investigate all reasonable options by seeking information from potential vendors, as each will certainly offer different features, functionality, support strategies, and costs. Once you have this information, you are in a position to ascertain the suitability of selected systems for your organizational needs. There are several options when deciding to purchase an LMS.

These include:

- Purchasing an off-the-shelf LMS and using it as is;
- Purchasing an off-the-shelf LMS and modifying it;
- Having a LMS custom-developed for your needs; and Developing your own LMS based on the architecture of The Open Knowledge Initiative.

Of course, the best option for anyone will depend upon their readiness, budget, how closely an off-the shelf LMS programme supports their unique needs, and their overall e-learning plan. It is very likely that no single off-the-shelf LMS programme will have all the features or performs all the functions required to comply a 100% with all of anyone's needs. Selecting the right LMS is very user specific and involves a series of tradeoffs between user needs, capabilities and the suppliers of the technology.

DIGITAL LEARNING OBJECTS

Interest in digital learning objects is directly related to the growth of e-learning. Digital learning objects are like books, journal articles and other types

of learning and teaching resources that may be found on the shelves of libraries and bookshops. However, unlike most books and journal articles that are found in libraries and bookshops, digital learning objects are stored only in electronic form, hence its association with e-learning. Digital learning objects may include anything from a set of learning outcomes, learning designs or whole courses to multimedia and other forms of resources, as long as they are kept in electronic from. Like books and journal articles, digital learning objects are catalogued and stored in learning object repositories so that they can be easily identified, searched and reused. While standards and conventions for cataloguing books and journals are widely known and adopted, the standards for cataloguing digital learning objects are still in the early stages of their development.

WHAT IS A LEARNING OBJECT

A "learning object" is any item that has the potential to promote learning. As such, a printed book, a journal article, or a newspaper report is a learning object. The term "learning object" is derived from object oriented programming where items of potential educational use are seen as "objects". An object in this context is generally understood as an amalgamation of related variables and methods. Therefore, an object that can promote learning and teaching is seen as a "learning object". A key attribute of learning objects is their discrete nature. Their discreteness enables learning objects to be categorized and stored independently, and reused in a range of educational settings.

Developers of learning objects have used a range of descriptors to capture their discrete character. Some of these descriptors include molecular, organic or granular structure, LEGO or Lincoln Logs. Like any other real-world object such as a car, house or a boat, a learning object will have a commonly recognizable state and behaviour. A car, for instance, will have a name, make or model, and a definition of its engine power and performance in particular settings. In the same way, a learning object can have descriptors of its state and behaviour. Describing and labeling learning objects accordingly will enable them to be easily and accurately identified for reuse by multiple users and in a range of educational settings. This is exactly what cataloguing systems such as the Library of Congress Classification System, and referencing conventions such as the American Psychological Association Publications Style aim to accomplish.

WHAT IS A DIGITAL LEARNING OBJECT

A "digital learning object" is any electronic resource that has the potential to promote learning. Typically these include scripts, images, and multimedia modules etc in digital format. They are often developed as discrete entities so that they can be reused by multiple users and in a range of educational settings. Since the development of digital learning materials is an extremely time-consuming and expensive undertaking, the assumption is that once developed, they ought to be able to be used, reused and shared by a large number of people and in a wide range of settings.

CHARACTERISTICS OF LEARNING OBJECTS

Apart from being discrete entities, learning objects are identifiable by several other notable features. For instance, learning objects must necessarily be able to be easily transported, and reused in a variety of educational settings, otherwise there isn't much point in developing these as discrete entities. They must also be interoperable in a range of educational environments otherwise their potential for reuse is compromised, which will clearly impact their value and use. Moreover, as interest in learning objects grows, there is likely to be a wide variety of learning objects that are developed, just as there are a wide variety of other types of learning resources that can be found in bookshops and libraries.

Some of these learning objects will comprise just the content item. However, others will comprise much more than the content including expected learning outcomes, assessment items to ascertain if these learning outcomes have been achieved as well as metadata on the object. There will also be a wide variety of learning objects that will be developed. These would include learning objects that are factual, procedural, principle-based, and conceptual. With increasingly more detail being added to learning objects, they are likely to become more context-bound rather remain more context-independent. Moreover, as the focus on the instructional role of learning objects intensifies, there is serious danger that learning objects will begin to drive pedagogical practices rather than pedagogy driving the use of the learning resources. There is already talk of pedagogy in advance of learning objects. Developers of learning objects will need to be aware of the advantages and disadvantages of this trade-off between context-dependence and context-independence of learning objects and the implications for their use and interoperability.

PURPOSE AND MISCONCEPTIONS

It is widely acknowledged that digital learning objects are developed to promote learning and teaching. It has also been suggested that "the future of learning is inextricably linked to the development of quality learning objects". While there is no doubt that learning can benefit from good quality learning resource materials, high quality learning is the result of many more factors than learning objects or resources. The factors that influence learning include learner readiness, their interest and motivation in the study of the subject matter, the nature and quality of the learning experience including the nature of the assessment activities, and the nature and quality of feedback and support that is available to students. Hence it seems unwise to suggest that learning objects are going to determine the future of learning. Just as best selling books have not necessarily improved the quality of learning, there is no reason to assume that learning objects are going to significantly impact the quality of learning.

IDENTIFYING AND DEFINING DIGITAL LEARNING OBJECTS WITH METADATA

In order for digital learning objects to be easily identified and located by users, they have to be uniformly and systematically defined with metadata.

Metadata is data about data. They are similar in type and serve the same purpose that is served by data that is found on library catalogue cards about the state and behaviour of various resource items in a consistent format. Work on the development of learning object metadata standards has been led by the Institute of Electrical and Electronics Engineers Learning Object Metadata standards committees.

The metadata standards that have been developed by IEEE LOM standards committees have been refined and simplified by various groups including CanCore. Other similar best practice guidelines include the Dublin Core Usage Guide, the CIMI Guide to best practice, and the online Archive of California Best Practices Guidelines. While work on the development of standards for learning object metadata continues, some concerns have been expressed about the nature and direction of this work.

Some of these concerns include:

- The relationship of best practice guidelines to the development of tools for the creation of metadata. It is suggested that these tools must be developed so that they are able to be adapted to meet the requirements of particular user groups and specific implementations.
- Partial automation of the creation of metadata. As tools for the creation of metadata are being developed, it is suggested that many of these processes can be automated via content creation tools.
- End-users need not be directly exposed to many of the structures of Learning Object Metadata. The suggestion is that it is not advisable to present less skilled end-users with all the elements for the creation of metadata.
- Learning object metadata does not offer any provisions for version control or digital rights management. Learning object metadata has elements that address some of these concerns, but these are insufficient for a proper management of issues related to intellectual property.

PROCESSES OF PACKAGING, STORING AND DISTRIBUTING DIGITAL LEARNING OBJECTS

Digital learning objects, once they have been appropriately classified and labeled with metadata, are best stored in learning object repositories which can enable them to be easily located, shared and reused in a variety of educational settings. Digital learning object repositories are "the libraries of the e-learning era". When made available in such repositories, digital learning objects are also open to peerreview and scrutiny which in-turn is useful for the improvement of their quality.

It is unlikely, however, that a single repository will be able to house in one place all digital learning resources, just as no one library stores all the books in

one location, or no one publisher publishes and distributes all the books. Digital learning objects can be stored and made available to users in a range of ways and from a variety of locations. Therefore, it makes sense to have a "distributed" model of learning object repositories which uses network communications technologies to distribute and share digital learning objects among repositories. These authors also suggest that a successful digital learning object repository is one that promotes the sharing of records along with being able to facilitate access to the learning objects. Like specialist libraries, there might be learning object repositories which will specialize in housing particular types or genre of resources.

Useful specialist repositories might be those that might house only "experience based learning designs" or assessment strategies that are congruent with constructivist or collaborative learning designs. Moreover, like different libraries, these repositories may also offer different, and a wide range of services to its users. A number of initiatives in the development of digital learning object repositories that demonstrate a distributed repository architecture have been described by Richards, Hatala and McGreal. These include POOL, POND and SPLASH. Other efforts in building learning object repositories include MERLOT, CAREO, and a growing list of Learning Content Management Systems - LCMSs.

IMPLICATIONS OF AN "EDUCATIONAL OBJECT ECONOMY"

With the growth in e-learning and online learning, there is sure to be increasing interest in the development, storage, and distribution of digital learning objects. Proponents of e-learning and online learning are certain and very clear about the central role that digital learning objects and repositories will play in such educational settings. Some claim that "the future of learning is inextricably linked to the development of quality learning objects", others see digital learning objects as the "building blocks of e-learning", and learning object repositories as the "libraries of the e-learning era" with the potential to "fuel e-learning as the stock exchanges fuelled the industrial era". There are some others who are not as enthusiastic or convinced about an educational economy that is founded on the promise of digital learning objects–at least not just yet. However, these are still early days in the development, cataloguing, storing and sharing of digital learning objects. While digital learning repositories anxiously await for a critical mass of learning objects to be developed, there is no doubt that the currently limited pool of resources will grow. The standards for cataloguing digital learning objects with metadata are still evolving.

There are many problems in current practices with the lack of clarity and consistency in the definition of various attributes of learning objects such as in their level of interactivity and their context. There are also unresolved issues with the location and opportunities for viewing suitable items from a digital learning repository as is possible in libraries. A critical issue in the development, storage and sharing of digital learning objects is related to how academics and

developers of such material view academic work and intellectual property issues related to it. Traditionally academic output in the form of publications has been handled by commercial publishers just as to longstanding publication and distribution practices. However, conventions in relation to the production, distribution and sale of digital learning objects are still unclear and emerging. For instance, there are concerns about the rewards to academics and developers for developing learning objects and sharing these across repositories. Making them freely available in repositories is not necessarily in the best interest of academics. A key promise of digital learning objects and its availability across repositories is the opportunity for benefiting from sharing and reusing resources that are expensive and time-consuming to produce.

While this sounds like a laudable concept, it has been suggested that not all content developers are likely to be as enthusiastic about making available their learning and teaching content on repositories without appropriate rewards and safeguards against its use and adaptation. Moreover, not all learning objects may be able to be used as is in different educational settings. This means that there will be a tendency for users to modify and adapt the original version for their use.

Naturally this would require the consent of the original owner and developer of the learning resource. Furthermore, once a digital learning resource is modified, there will be issues relating to the ownership of the revised version and how the original work should be acknowledged. Clearly without appropriate digital learning objects rights management conventions, such issues and concerns will hinder progress on the sharing of digital learning objects across learning object repositories.

PEDAGOGICAL DESIGNS FOR OPTIMIZING E-LEARNING

It is widely acknowledged that the role and influence of media on learning and teaching is optimized especially when it is skillfully integrated into the educational experience. For this to happen we need to focus our attention foremost, on the careful design of the learning experience rather than the presentation of the subject matter content or the technology. This means careful orchestration of what the learners are going to do in the learning environment. This concept of "learning by doing" has been popularized, among others, by Roger Schank and his collaborators and it is at the heart of pedagogical designs that stand to optimize e-learning.

These pedagogical designs include "scenariobased learning", "goal-based learning", "problembased learning", "case-based learning", "learning by designing", and "role-play-based learning". These pedagogical designs are grounded in the principles of constructivism and situated cognition, and in the belief that learning is most efficient and effective when it is contextualized and when it is based on realworld or similarly authentic settings.

SCENARIO-BASED LEARNING

A very good example of learning by doing is scenario-based learning. Scenario-based learning is a pedagogical design where one or more learning scenarios serve to anchor and contextualize all learning and teaching activities. The scenarios in these educational settings are usually drawn from real life situations. They may be contrived but they aim to be as authentic as possible and reflect the variety and complexity that is part of real life situations.

For the teacher and the tutor this scenario provides a meaningful context which can be used to explain abstract concepts, principles and procedures a lot more easily. For the learner, it serves to make learning relevant, meaningful and useful. Typically a good learning scenario will reflect a common occurrence from the relevant field. It may be a case, problem or incident that is commonly encountered in the workplace.

Using such cases, problems or incidences from the workplace in the education of learners serves to more adequately prepare them for the workforce as opposed to focusing their attention on the mastery of the subject matter content. The use of such scenarios is particularly relevant and meaningful in professional education. A typically good learning scenario will sound like a story or a narrative of a common occurrence. It will have a context, a plot, characters and other related parameters. It usually involves a precipitating event which places the learner or a group of learners in a role, or roles that will require them to deal with the situation or problems caused by the event. The roles that learners might be asked to assume are those that they are likely to play in real life as they enter the workforce.

Attached to these roles, will be goals that learners will be required to achieve. In order to achieve these goals they will be assigned numerous tasks and activities, some of which may require them to collaborate with their peers and other relevant groups, if these are part of the intended learning outcomes of their subject. While these activities essentially serve as learning enhancement exercises, a selection of them could be made assessable and given a mark which would contribute to the student's final grade in the subject. In order to attain the goals that learners are assigned in the scenario, and complete all the required activities, learners will have access to a wide range of relevant resources. These resources could include textbooks and other relevant reading material, multimedia content, and also experiences from the field of how expert practitioners have gone about solving or dealing with similar cases, situations, problems or incidences.

The learning scenario, its accompanying learning activities, and the assessment tasks serve as essential scaffolds for promoting and engendering meaningful learning activity. They also serve to contextualize learning and motivate learners who are turned off by too much focus on the mastery of the subject matter content and not enough on practical and generalizable skills.

The assessment tasks and learning activities which the students are assigned are critical to the achievement of the intended learning outcomes. It is therefore essential that they are congruent with the intended learning outcomes for the

subject. While they are embedded within the learning scenario they must be carefully designed and skillfully applied to direct students to the core subject matter content. By successfully completing these assessment tasks and learning activities, it is expected that learners will have accomplished the intended learning outcomes of the subject.

RELATED PEDAGOGICAL DESIGNS

Other pedagogical designs that are also grounded in the concept of learning by doing include "problem-based and goal-based learning", "case-based learning", "role-play-based learning", and "learning by designing". They are different from scenario-based learning in the nature of the "precipitating event" or "trigger" in the situation. A brief discussion of each follows.

PROBLEM-BASED AND GOAL-BASED LEARNING

Of all learning by doing type pedagogical designs, these two designs are in fact most similar in orientation to scenario-based learning. In problem-based learning, a problem situation serves as the context and anchor for all learning and teaching activities. Problem-based learning begins with the presentation of a problem to students, which can be in the form of short video clip, a picture with text, or just text.

Upon encountering this problem situation, students are expected to analyse it and decide what needs to be done next. A critical feature of problem-based learning is small group problem-solving and inquiry. Students work in small groups to analyse the presenting problem, make decisions on what needs to be done next, and act upon them to resolve the problem situation satisfactorily.

In so doing they will have been expected to achieve the intended learning outcomes. While problem-solving is implicit in problem-based learning, learners are not told explicitly what is their role in the problem, or what they are supposed to do as they seek to analyse the presenting problem. In goal-based learning, on the other hand, they are told very specifically what is their role in the scenario and what they are supposed to do in order to resolve the problem satisfactorily. How they go about analysing the problem to achieve a satisfactory solution to the problem is left to their imagination and creativity. Both, problem-based and goal-based learning designs have been widely used in the study of medical, education and environmental sciences.

CASE-BASED LEARNING

In case-based learning, a case serves to provide the context and anchor for all learning and teaching activities. Cases have been very widely used in the study and teaching of Law, Business, Accounting and Economics. In these instances, students are required to use the case to explore issues, concepts and problems that they are likely to encounter.

Cases that stand to optimize learning and teaching opportunities are those that have the richness, complexity and variety that is embedded in real life

situations and encounters. It is therefore most important that the cases that are selected for study and teaching are carefully selected to match the intended learning outcomes for the subject.

LEARNING BY DESIGNING

In learning by designing, the design task affords the essential anchor and scaffold for all learning and teaching activities. In this learning design students are required to engage in a learning activity which comprises conceptualizing and building something. This is a common learning and teaching activity in the study of architecture, and engineering sciences. As in goal-based learning, in the case of learning by designing, the goal is made very clear to the students. How the students chose to pursue that goal and achieve the targeted learning outcomes is left to their imagination and creativity.

ROLE-PLAY-BASED LEARNING

In role-play-based learning, the role-play provides the anchor and scaffold for all learning and teaching activities. Role-play is widely used as a valuable learning and teaching strategy in social sciences and humanities subjects where very complex processes are prevalent. This learning design comprises the playing out of identified roles by learners which is followed with reflection upon the activity and its analysis in order to focus attention on the expected learning outcomes for the study.

ASSESSMENT, FEEDBACK, AND E-MODERATION

ASSESSING LEARNING OUTCOMES

Assessing learning outcomes is concerned with determining whether or not learners have acquired the desired type or level of capability, and whether they have benefited from the educational experience. A measure of learning outcomes requires learners to complete tasks, which demonstrate that they have achieved the standards specified in the learning outcomes. In order to ascertain the most realistic and valid assessment of performance, these task(s) have to be as similar to on-the-job conditions, that is, as authentic as possible.

A major purpose of assessment in education is the improvement of learning. When focusing on the improvement of learning, it is essential to bear in mind the congruency between the learning outcomes of a course and the measures of learning achievement. It is not uncommon to find measures of learning achievement that do not address the learning outcomes of the course. When this is the case, learner motivation in the course and their performance is adversely affected. Learning outcomes of a course must be given careful thought as quite often, insufficient attention is paid to the learning outcomes of a course. Without a clear set of outcomes, it is difficult to determine criteria for ascertaining whether

we have arrived at the place for which we set out. While some skills and competencies are easier to assess, there are many others that are more difficult to assess and grade. Therefore a range of measures of achievement is necessary to assess the wide variety of skills and competencies that need to be acquired. In all cases however, the only fair form of assessment is one that is very transparent, with explicitly stated criteria for students. Therefore, it is important to clearly specify and communicate the basis for all assessment measures. When this is the case, assessment can serve as a powerful teaching tool.

METHODS OF ASSESSMENT

Measures of learning achievement can be classified as either criterion or norm-referenced. A criterion-referenced measure is targeted at the criteria specified in the learning outcome. Criterion-referenced measures require learners to demonstrate presence of learned capabilities in relation to specified criteria. A norm-referenced measure compares a learner's performance against that of other learners in the cohort.

This form of assessment rates student performance against the normal distribution of abilities in the population. In any learning context, a range of assessment methods may be used to determine learning achievement.

These may include:

- Actual performance on an authentic site or a simulated condition such as a model.
- Oral responses which comprise verbal and/or visual presentations to questions.
- Written responses which comprise typed or hand-written responses to questions.

However, as learning becomes more collaborative, situated and distributed in its context, conventional methods of assessment of learning outcomes become inadequate. These have to be replaced with tasks and assessment procedures that can be focused on the processes of learning, perception, and problem solving. Methods that can capture some of these processes are learning logs, critical reflections and portfolios. In situated learning contexts, assessment can no longer be viewed as an add-on to the learning and teaching process, or seen as a separate stage in a linear process of instruction and post-test.

Assessment must become a continuous part of the learning process where it serves to promote and support learning. Assessment that is designed to promote and support learning during the course of the learning and teaching process, may be seen as serving a formative purpose in that it allows skills development to be identified, reflected upon and corrected in a continuous manner. Assessment that seeks to ascertain a final measure of learning capability often at the end of a course, serves as a summative measure. A one-off sampling of students' work is not adequate to make a reliable judgment of the overall quality of their work. We need to examine student's work regularly and continuously without drowning either the students or staff in meaningless tasks.

BEST ASSESSMENT PRACTICES

Principles of best practices in the assessment of learning outcomes are not hard to find. The American Association of Higher Education has sponsored the development of a set of these that are available from the Web. The following are a selection of sound assessment practices drawn from these sources.

- Assessment of learning achievement must be grounded in sound educational principles. Assessment should not be considered as an end in itself. It should be seen as an effective instrument for learning improvement, and especially because students give it so much attention. Its effective use embodies the kind of learning we value for our students. These educational principles should drive not only what we assess but also how we assess. When issues about educational principles, goals and values are overlooked, assessment becomes an exercise in measuring what is easy, rather than a process of improving learning.
- Assessment is most effective when it reflects an understanding of learning as multidimensional, integrated, and revealed through performance over time. Learning is clearly a very complex process. It entails not only the development of knowledge and understanding in a given domain, but what learners can do with that knowledge and understanding. It also involves the development of desirable values, attitudes, and behaviours which affect academic success and performance outside the formal educational setting. Assessment should reflect these understandings by employing a diverse array of methods, including those that call for actual performance, over time so as to reveal change, growth, and increasing degrees of integration of what has been learned and taught.
- Assessment works well when, what it seeks to improve learning and when its intentions are transparent. Assessment of learning achievement is a goal-oriented process. It entails comparing actual performance and behaviour with intended learning outcomes and expectations. Clear, shared and realistic goals are the pre-requisites for focused and useful assessment practices.
- Assessment requires attention to the achievement of learning outcomes as well as the experiences that led to those outcomes. Teachers and students tend to place a great deal more emphasis on measures of the achievement of learning outcomes. However, to improve learning outcomes, we need to know something about students' experiences along the way. Certain assessment practices

such as the use of learning logs and portfolios, for instance, can help us understand which students learn best under what conditions.

- Assessment works best when it is continuous. Learning improvement is best supported when assessment comprises a series of activities performed over the duration of study. This may mean tracking the progress of individual students or of cohorts of students and providing them with the necessary feedback and guidance.

ONLINE ASSESSMENT TOOLS

Moreover, most prominent learning management systems, such as Blackboard and WebCT come with built-in assessment tools which allow the development of questions and surveys with objective type as well as open-ended responses. These are useful in online education as they enable frequent testing and provision of feedback. However, they remain somewhat unsuited for assessing more complex learning activities such as group work and project work.

THREATS TO ONLINE ASSESSMENT PRACTICES

With online education comes increasing problems with security and the authenticity of work that is submitted by students as part of their assessment requirements. As a result there has been growing concerns about the improper use of material from the Internet. In order to combat misuse of material from the Internet, software programmes such as "Turnitin" have been developed. This software can be integrated and used with major learning management systems such as Blackboard and WebCT.

PROVIDING FEEDBACK

Assessment activities are most effective when they are accompanied with feedback. From a review of research on the effects of feedback, Kulhavy concluded that while feedback can be used to correct errors in performance, feedback is more effective when it follows a student response. However, Kulik and Kulik observed that feedback delivered following learners' response is beneficial only under controlled and somewhat artificial conditions. They recommended immediate feedback for conventional educational settings. Schimmel found that the amount of information in feedback was unrelated to its effects and Bangert-Drowns, Kulik, Kulik and Morgan showed that feedback does not always increase achievement. From these general assessments of the effects of feedback, several conclusions can be drawn about feedback and the conditions of feedback in learning.

- At the simplest level, feedback is aimed at correcting errors in understanding and performance. However, like the assessment of learning outcomes, the provision of feedback is a lot more complex process.

  - Feedback is usually designed to inform learners about the quality and/or the accuracy of their responses. This kind of feedback is specific and directly related to the performance of the prescribed task. It may be delivered directly to the learners, or mediated by information and communications technology.
  - Feedback can be directed at different aspects of learning. Some feedback is primarily designed to influence affective learning outcomes such as motivation. Others might be directed at understanding of subject matter content.
- Feedback may differ in terms of its content which is identifiable by:
  - The amount of information proffered in the feedback;
  - The similarity between information in the feedback and that in the learning and teaching transaction; and
  - Whether the feedback restated information from the original task, referred to information given elsewhere, or provided new information.

MODERATING ONLINE LEARNING

Moderation of the learning process comprises supporting learning with the help of a variety of instructional interventions. It is an integral part of any educational context and is often carried out by teachers and tutors as well as students themselves. Moderation of learning can serve several purposes. One of its most important functions is the provision of feedback on learning.

In online learning, where the teacher is not in situ during much of the learning and teaching process, moderation takes on an added degree of importance. E-moderation refers to the acts of managing, facilitating and engendering group based computer-mediated communication. Such communication can be synchronous or asynchronous. In the synchronous mode, even though the participants may be physically separated from one another, the communication takes place in real time. Synchronous computer-mediated communication is quite like a telephone conversation except that the communication channel in the former is normally text-based while in the latter it is voice-based. Synchronous voice-based communication that is mediated by computers is becoming possible with Voice over Internet software. In the asynchronous communication mode, participants involved in the discussion are active at different times, and may be separated from one another by physical distances.

In the asynchronous mode, those who wish to communicate with others can do so in their own time and place without the need for face-to-face contact or being online at the same time. Users can post messages to new or current issues in their own time where these messages are stored for others to view, comment on, and review later.

COMPUTER MEDIATED COMMUNICATION TECH-NOLOGIES

Computer mediated communications technologies that enable manage and support such group-based discussion are reviewed. For a review of computer mediated conferencing technologies and a discussion of their uses see Harasim, Harasim, Hiltz, Teles and Turoff, Mason and Kaye, Naidu, Naidu, Olsen and Barrett, and Rapaport.

E-mail: One-to-one Communication

E-mail refers to electronic communication between two individuals with the help of a suitable software application such as Yahoo mailTM, EudoraTM or Microsfot OutlookTM. Wherever the appropriate technology is available, e-mail is being very widely adopted for private and personal communication, as well as for the conduct of business activities.

E-mail List: One-to-many Communication

An e-mail list is an electronic mail facility that allows one-to-many communication via text-based e-mail communication. Mailing lists are often used to support discussions or information exchanges on a certain subject among a group of people who are subscribed to that mailing list. Upon subscribing to the list, each subscriber gets every message that is submitted to the list. A common form of a mailing list is as a newsgroup. There are newsgroups on just about every subject you can think of. Some groups discuss only one subject, while others cover a number of different subjects.

Inter-relay Chat: One-to-one and One-to-many Communication

Inter-Relay Chat or "talk" is a way of communicating electronically with people in "real time", that is, synchronously. In this mode, participants in the chat session are able to send and receive messages almost immediately. Of course, they need to be logged on at the same time.

Electronic Bulletin Boards: One-to-many Communication

Electronic bulletin boards are like good old fashion notice boards, except that the former are electronic spaces and the latter are physical spaces where you can stick a note with thumb tacks. Electronic bulletin boards are electronic spaces where you are able to post information for others to read at their own time and pace.

Computer Conferencing: One-to-many Communication

Computer conferencing combines the functionality of electronic mail and electronic bulletin or message boards. Messages sent to a computer conference are stored in a central location rather than being distributed to individual e-mail boxes such as in a mailing list. Just as in face-to-face conference settings where participants have to move to particular rooms to hear particular speakers,

participants in a computer conference are required to actively access the e-mails in computer conferences which will be waiting for action in that conference.

Once they are logged into the conference, participants can read a response and act on it. This is asynchronous communication because a participant can respond to a message or contribute to a discussion at anytime and from any place. The messages sent to the conference are stored on the host computer from where a participant can read it, reply to it, or start a new thread.

ATTRIBUTES OF GOOD CONFERENCING SYSTEMS

David Woolley suggested that no one computer mediated conferencing system has the potential to meet all the needs of someone. Having said that, he has put forth a number of attributes of good computer mediated conferencing systems.

Separate Conferences for Broad Topics

Most conferencing systems will afford this feature. Whether the discussion areas are called conferences, forums, or newsgroups, they provide a basic level of organization. Different conferences enable a focus on different subjects or topics, and allow you to establish small discrete groups or communities who are enthusiastic about particular topics. These communities can grow to cement their interests and relationships beyond the formal educational settings.

Threaded Discussions within Conferences

Most conferencing software also enable posting of messages in response to other messages such that a line of responses can be traced back to the original comment. This is called "threading" and it takes the form of a hierarchical structure, in which the topic is the starting point for a series of responses that follow. Most conferencing systems offer this capability for up to two to three responses to an original thought. Threads can get lost after that which is why it is very important to impress upon participants to keep their comments focused on the topic and to start a new thread when necessary.

Informative Topic List

A conference participant should be able to easily see the list of the topics in a conference and the questions or issues that need a response. At the minimum, the list of topics in a conference should show each topic's title and some indication of the amount of activity in the topic: the number of responses, date of the last response, or both. The topics should be able to be sorted in some form. Participants should always be able to go back to the beginning of a topic and follow it through to the most recent response.

Support for Both Frequent Readers and Casual Browsers

A computer conference should support both, frequent reading and casual browsing. Those who wish to browse should be able to choose a conference manually and scroll through the list of topics, moving backward or forward

sequentially through topics, and returning to the topic list. A frequent reader, on the other hand, should be able to move through a list of conferences, skipping topic lists entirely and getting immediately to the new, unread messages. Moreover, readers should be able to search messages by date, author, or keyword.

Access Control

Publicly accessible conferences will require different types of access and control than those within the context of a formal online course. In a publicly accessible conference, a conference host or moderator will need control over who can access the conference and what level of access is allowed to participants. For example, it might be necessary to give some participants read and write permission, and others read only access.

The situation in a conference within a formal course would be different as every participant there will be required to have read and write access. Moreover, the host of a conference should have good tools for managing a conference discussion, such as tools for weeding out obsolete topics, archiving those that are worth saving but no longer active, and moving a divergent thread of a topic to a new topic of its own.

E-MODERATION SKILLS

While creating opportunities for learning, online learning environments also create demands on learners for new skills in managing their own learning. Being successful in such learning environments requires learners to have the ability to organize, evaluate, and monitor the progress of their learning. Not all learners possess these skills, and so they have to be taught how to take advantage of the opportunities that online learning affords. A useful way of conceptualizing key skills for managing and facilitating computer mediation conferencing has been developed by Salmon.

Forming

The first task in the moderation of an online learning environment comprises the orientation of participants for computer conferencing. At this early stage, several skills are necessary for the formation of the group. In a formal educational setting, it is very likely that most of the participants will not know each other. So it will be important to provide them with an opportunity to introduce themselves to others in the group.

This will comprise explaining their academic and other interests but more importantly their specific interest in the subject. Some students will be familiar with the conventions of computer mediated conferencing, while others will not. Some may be threatened by the technology and irritated by many of the conventions of this mode of communications. As such it may be useful to agree on some common ground rules for communicating online. At this early stage the development of respect, tolerance and trust among the group is very important.

The moderator can set the tone of the communication, and try to model those sorts of behaviours for the group to emulate. These would include things like, how much to write in each message, how frequently, and the tone of the language that might be appropriate. Some agreement at this stage on the etiquettes of communicating on the net would be appropriate.

Functioning

This comprises ensuring that the group is on track for completing the assigned tasks. Foremost, it will include making clear the goals and outcomes of the conference. In addition to this, providing some structure and direction for the ensuing discussions will lead to a coherent conversation on the assigned topic. Participants should be encouraged to participate responsibly, and equitably to ensure that everyone is contributing their fair share to the discussions. Participants should also be encouraged to share their ideas and opinions with group members in good faith. They ought to feel free to ask questions, and seek the opinions and support of others in the group.

Formulating Skills

By this stage in the discussion, conference participants are able to build a deeper level understanding of the subject matter. Strategies to support this will include summarizing the ideas and thread of the discussion at regular intervals, asking participants to assist and check each other's understanding of complex ideas, linking theory with practice and elaborating current material with previously learned material.

Fermenting

This is starting to happen when participants are engaging more readily in debate and discussion about the central issues, challenging each other's ideas, meanings, reasoning and concepts. Any controversies in this regard need to be handled very carefully by the moderator, and students should be taught the skills to manage debates. Criticizing ideas without criticizing people is an important but difficult skill to develop. It is important to challenge the ideas of others but it is essential that students learn not to alienate other group members in this process.

For example, ideas can be challenged in subtle ways by asking questions, suggesting alternatives, asking for their reasoning and justification of arguments. Students could be encouraged to find out how the thinking and reasoning of group members' differ and how the different ideas could be integrated into a smaller set of propositions on the subject. At the end of this process, the moderator must bring the discussion to some sort of a close.

6

Online Learning Platform

A virtual learning environment (VLE) is a system designed to support teaching and learning in an educational setting, as distinct from a Managed Learning Environment (MLE), where the focus is on management. A VLE will normally work over the Internet and provide a collection of tools such as those for assessment (particularly of types that can be marked automatically, such as multiple choice), communication, uploading of content, return of students' work, peer assessment, administration of student groups, collecting and organizing student grades, questionnaires, tracking tools, *etc.*

New features in these systems include wikis, blogs, RSS and 3D virtual learning spaces. VLE's are often used in schools and other educational establishments in order to make the learning experience more interactive. While originally created for distance education, VLEs are now most often used to supplement traditional face to face classroom activities, commonly known as Blended Learning. These systems usually run on servers, to serve the course to students Multimedia and/or web pages. In some programmes, such as Elluminate, a virtual learning environment can be similar to a face-to-face classroom environment in that it allows direct communication with the teacher.

Students can use emoticons to "raise their hand," show that they are confused, show that they understand what the teacher is saying, and even give applause for something that the teacher says. Students are also able to talk to the teacher when called on. In many of these virtual learning environments the students are able to write on the "virtual classroom chalkboard." This allows them to show their work for the rest of the class to see. Students can also be split up into groups in order to work with each other and discuss topics that the teacher

introduces. Many virtual learning environments give teachers the ability to share multimedia files such as video and audio files as well as the ability to transfer important documents (Word, PDF,…*etc.*) directly to students.

WEB-BASED SIMULATION

The term web-based simulation (WBS) emerged in 1996, and is typically used to denote the invocation of computer simulation services over the internet, specifically through a web browser. Increasingly, the web is being looked upon as an environment for providing modeling and simulation applications, and as such, is an emerging area of investigation within the simulation community. Web-based simulation is used in online computer games. It is also used in e-learning in view to quickly illustrate various principles to students by means of interactive animations, or in distance learning to provide an alternative to installing expensive simulation software on the student computer, or as an alternative to expensive laborative equipment.

Web-based simulation can either take place on the server-side or on the client-side. In server-side simulation, the numerical calculations and generation of graphical output is carried out on the web server, while the graphical user interface often is provided by the client-side, for example using server-side scripting such as PHP or CGI scripts, interactive services based on Ajax or a conventional application software remotely accessed through a VNC Java applet. In client-side simulation, the simulation programme is downloaded from the server side but completely executed on the client side, for example using Java applets, Flash animations, JavaScript, or some mathematical software viewer plug-in.

Server-side simulation is not scalable for many simultaneous users, but places fewer demands on the user computer performance and web-browser plug-ins than client-side simulation. The term on-line simulation sometimes refers to server-side web-based simulation, sometimes to symbiotic simulation, *i.e.*, a simulation that interacts in real-time with a physical system. With the upcoming cloud computing technologies, almost unlimited resources can be used for new simulation approaches. For instance, there are multi-agent simulation applications which are deployed on cloud computing instances and act independently. This allows simulations to be scalable to almost infinity.

E-LEARNING MATURITY MODEL TOPICS

KEY IDEA

The key idea underlying the dimension concept is holistic capability. Rather than the eMM measuring progressive levels, it describes the capability of a process from these five synergistic perspectives. An organization that has developed capability on all dimensions for all processes will be more capable than one that has not. Capability at the higher dimensions that is not supported

by capability at the lower dimensions will not deliver the desired outcomes; capability at the lower dimensions that is not supported by capability in the higher dimensions will be ad-hoc, unsustainable and unresponsive to changing organizational and learner needs.

Five Dimensions of eMM

Capability in each process is described by a set of practices organised by dimension. The eMM supplements the CMM concept of maturity levels, which describe the evolution of the organisation as a whole, with dimensions.

The five dimensions of the eMM are:

1. Delivery
2. Planning
3. Definition
4. Management
5. Optimisation

EDUCATIONAL TECHNOLOGY

Educational technology is the study and ethical practice of facilitating learning and improving performance by creating, using and managing appropriate technological processes and resources." The term educational technology is often associated with, and encompasses, instructional theory and learning theory. While instructional technology covers the processes and systems of learning and instruction, educational technology includes other systems used in the process of developing human capability. Educational Technology includes, but is not limited to, software, hardware, as well as Internet applications and activities. But there is still debate on what these terms mean.

EXPLANATION AND MEANING

Educational technology is most simply and comfortably defined as an array of tools that might prove helpful in advancing student learning. Educational Technology relies on a broad definition of the word "technology". Technology can refer to material objects of use to humanity, such as machines or hardware, but it can also encompass broader themes, including systems, methods of organization, and techniques. Some modern tools include but are not limited to overhead projectors, laptop computers, and calculators.

Newer tools such as "smartphones" and games (both online and offline) are beginning to draw serious attention for their learning potential. Those who employ educational technologies to explore ideas and communicate meaning are learners or teachers. Consider the Handbook of Human Performance Technology. The word technology for the sister fields of Educational and Human Performance Technology means "applied science."

In other words, any valid and reliable process or procedure that is derived from basic research using the "scientific method" is considered a "technology."

Educational or Human Performance Technology may be based purely on algorithmic or heuristic processes, but neither necessarily implies physical technology. The word technology comes from the Greek "techne" which means craft or art. Another word, "technique," with the same origin, also may be used when considering the field Educational Technology. So Educational Technology may be extended to include the techniques of the educator. A classic example of an Educational Psychology text is Bloom's 1956 book, Taxonomy of Educational Objectives. Bloom's Taxonomy is helpful when designing learning activities to keep in mind what is expected of—and what are the learning goals for—learners.

However, Bloom's work does not explicitly deal with educational technology per se and is more concerned with pedagogical strategies. According to some, an Educational Technologist is someone who transforms basic educational and psychological research into an evidence-based applied science (or a technology) of learning or instruction. Educational Technologists typically have a graduate degree (Master's, Doctorate, Ph.D., or D.Phil.) in a field related to educational psychology, educational media, experimental psychology, cognitive psychology or, more purely, in the fields of Educational, Instructional or Human Performance Technology or Instructional (Systems) Design. But few of those listed below as theorists would ever use the term "educational technologist" as a term to describe themselves, preferring terms such as "educator". The transformation of educational technology from a cottage industry to a profession is discussed by Shurville, Browne, and Whitaker.

A SHORT HISTORY

Educational technology in a way could be traced back to the emergence of very early tools, *e.g.*, paintings on cave walls. But usually its history starts with educational film (1900s) or Sidney Pressey's mechanical teaching machines in the 1920s. The first large scale usage of new technologies can be traced to US WWII training of soldiers through training films and other mediated materials.

Today, presentation-based technology, based on the idea that people can learn through aural and visual reception, exists in many forms, *e.g.*, streaming audio and video, or PowerPoint presentations with voice-over. Another interesting invention of the 1940s was hypertext, *i.e.*, V. Bush's memex. The 1950s led to two major, still popular designs. Skinners work led to "programmed instruction" focusing on the formulation of bahavioural objectives, breaking instructional content into small units and rewarding correct responses early and often. Advocating a mastery approach to learning based on his taxonomy of intellectual bahaviours, Bloom endorsed instructional techniques that varied both instruction and time according to learner requirements.

Models based on these designs were usually referred to as computer-based training" (CBT), Computer-aided instruction or computer-assisted instruction (CAI) in the 1970s through the 1990s. In a more simplified form they correspond to today's "e-contents" that often form the core of "e-learning" set-ups, sometimes also referred to as web-based training (WBT) or e-instruction. The

course designer divides learning contents into smaller chunks of text augmented with graphics and multimedia presentation. Frequent Multiple Choice questions with immediate feedback are added for self-assessment and guidance. Such e-contents can rely on standards defined by IMS, ADL/Scorm and IEEE. The 1980s and 1990s produced a variety of schools that can be put under the umbrella of the label Computer-based learning (CBL). Frequently based on constructivist and cognitivist learning theories, these environments focused on teaching both abstract and domain-specific problem solving. Preferred technologies were micro-worlds (computer environments were learners could explore and build), simulations (computer environments where learner can play with parameters of dynamic systems) and hypertext. Digitized communication and networking in education started in the mid 80s and became popular by the mid-90's, in particular through the World-Wide Web (WWW), e-mail and Forums. There is a difference between two major forms of online learning.

The earlier type, based on either Computer Based Training (CBT) or Computer-based learning (CBL), focused on the interaction between the student and computer drills plus tutorials on one hand or micro-worlds and simulations on the other. Both can be delivered today over the WWW. Today, the prevailing paradigm in the regular school system is Computer-mediated communication (CMC), where the primary form of interaction is between students and instructors, mediated by the computer. CBT/CBL usually means individualized (self-study) learning, while CMC involves teacher/tutor facilitation and requires scenarization of flexible learning activities.

In addition, modern ICT provides education with tools for sustaining learning communities and associated knowledge management tasks. It also provides tools for student and curriculum management. In addition to classroom enhancement, learning technologies also play a major role in full-time distance teaching. While most quality offers still rely on paper, videos and occasional CBT/CBL materials, there is increased use of e-tutoring through forums, instant messaging, video-conferencing, *etc.*

Courses addressed to smaller groups frequently use blended or hybrid designs that mix presence courses (usually in the beginning and at the end of a module) with distance activities and use various pedagogical styles (*e.g.*, drill and practise, exercises, projects, *etc.*). The 2000s emergence of multiple mobile and ubiquitous technologies gave a new impulse to situated learning theories favouring learning-in-context scenarios. Some literature uses the concept of integrated learning to describe blended learning scenarios that integrate both school and authentic (*e.g.*, workplace) settings.

THEORIES AND PRACTICES

Three main theoretical schools or philosophical frameworks have been present in the educational technology literature. These are Bahaviourism, Cognitivism and Constructivism. Each of these schools of thought are still present in today's literature but have evolved as the Psychology literature has evolved.

Bahaviourism

This theoretical framework was developed in the early 20th century with the animal learning experiments of Ivan Pavlov, Edward Thorndike, Edward C. Tolman, Clark L. Hull, B.F. Skinner and many others.

Many psychologists used these theories to describe and experiment with human learning. While still very useful this philosophy of learning has lost favour with many educators.

Skinner's Contributions

B.F. Skinner wrote extensively on improvements of teaching based on his functional analysis of Verbal Bahaviour and wrote "The Technology of Teaching", an attempt to dispel the myths underlying contemporary education as well as promote his system he called programmed instruction. Ogden Lindsley also developed the Celeration learning system similarly based on bahaviour analysis but quite different from Keller's and Skinner's models.

Cognitivism

Cognitive science has changed how educators view learning. Since the very early beginning of the Cognitive Revolution of the 1960s and 1970s, learning theory has undergone a great deal of change. Much of the empirical framework of Bahaviourism was retained even though a new paradigm had begun. Cognitive theories look beyond bahaviour to explain brain-based learning.

Cognitivists consider how human memory works to promote learning. After memory theories like the Atkinson-Shiffrin memory model and Baddeley's Working memory model were established as a theoretical framework in Cognitive Psychology, new cognitive frameworks of learning began to emerge during the 1970s, 1980s, and 1990s.

It is important to note that Computer Science and Information Technology have had a major influence on Cognitive Science theory. The Cognitive concepts of working memory (formerly known as short term memory) and long term memory have been facilitated by research and technology from the field of Computer Science.

Another major influence on the field of Cognitive Science is Noam Chomsky. Today researchers are concentrating on topics like Cognitive load and Information Processing Theory.

Constructivism

Constructivism is a learning theory or educational philosophy that many educators began to consider in the 1990s. One of the primary tenets of this philosophy is that learners construct their own meaning from new information, as they interact with reality or others with different perspectives. Constructivist learning environments require students to utilize their prior knowledge and experiences to formulate new, related, and/or adaptive concepts in learning. Under

this framework the role of the teacher becomes that of a facilitator, providing guidance so that learners can construct their own knowledge. Constructivist educators must make sure that the prior learning experiences are appropriate and related to the concepts being taught.

Jonassen (1997) suggests "well-structured" learning environments are useful for novice learners and that "ill-structured" environments are only useful for more advanced learners. Educators utilizing technology when teaching with a constructivist perspective should choose technologies that reinforce prior learning perhaps in a problem-solving environment.

INSTRUCTIONAL TECHNIQUE AND TECHNOLOGIES

Problem Based Learning and Inquiry-based learning are active learning educational technologies used to facilitate learning. Technology which includes physical and process applied science can be incorporated into project, problem, inquiry-based learning as they all have a similar educational philosophy. All three are student centered, ideally involving real-world scenarios in which students are actively engaged in critical thinking activities.

The process that students are encouraged to employ (as long as it is based on empirical research) is considered to be a technology. Classic examples of technologies used by teachers and Educational Technologists include Bloom's Taxonomy and Instructional Design.

THEORISTS

This is an area where new thinkers are coming to the forefront everyday. Many of the ideas spread from theorists, researchers, and experts through their blogs. Extensive lists of educational bloggers by area of interest are available at Steve Hargadon's "SupportBloggers" site or at the "movingforward" wiki started by Scott McLeod.

Many of these blogs are recognized by their peers each year through the edublogger awards. Web 2.0 technologies have led to a huge increase in the amount of information available on this topic and the number of educators formally and informally discussing it. Most listed below have been around for more than a decade, however, and few new thinkers mentioned above are listed here.

- Alan November
- Seymour Papert
- Will Richardson
- John Sweller
- Alex Jones
- George Siemens
- David Wiley
- David Wilson

BENEFITS

Educational technology is intended to improve education over what it would be without technology.

Some of the claimed benefits are listed below:

- *Easy-to-access course materials*: Instructors can post the course material or important information on a course website, which means students can study at a time and location they prefer and can obtain the study material very quickly
- *Student motivation*: Computer-based instruction can give instant feedback to students and explain correct answers. Moreover, a computer is patient and non-judgmental, which can give the student motivation to continue learning. According to James Kulik, who studies the effectiveness of computers used for instruction, students usually learn more in less time when receiving computer-based instruction and they like classes more and develop more positive attitudes towards computers in computer-based classes. The American educator, Cassandra B. Whyte, researched and reported about the importance of locus of control and successful academic performance and by the late 1980s, she wrote of how important computer usage and information technology would become in the higher education experience of the future.
- *Wide participation*: Learning material can be used for long distance learning and are accessible to a wider audience
- *Improved student writing*: It is convenient for students to edit their written work on word processors, which can, in turn, improve the quality of their writing. According to some studies, the students are better at critiquing and editing written work that is exchanged over a computer network with students they know
- *Subjects made easier to learn*: Many different types of educational software are designed and developed to help children or teenagers to learn specific subjects. Examples include pre-school software, computer simulators, and graphics software
- A structure that is more amenable to measurement and improvement of outcomes. With proper structuring it can become easier to monitor and maintain student work while also quickly gauging modifications to the instruction necessary to enhance student learning.
- *Differentiated Instruction*: Educational technology provides the means to focus on active student participation and to present

differentiated questioning strategies. It broadens individualized instruction and promotes the development of personalized learning plans. Students are encouraged to use multimedia components and to incorporate the knowledge they gained in creative ways.

CRITICISM

Although technology in the classroom does have many benefits, there are clear drawbacks as well. Lack of proper training, limited access to sufficient quantities of a technology, and the extra time required for many implementations of technology are just a few of the reasons that technology is often not used extensively in the classroom.

Similar to learning a new task or trade, special training is vital to ensuring the effective integration of classroom technology. Since technology is not the end goal of education, but rather a means by which it can be accomplished, educators must have a good grasp of the technology being used and its advantages over more traditional methods.

If there is a lack in either of these areas, technology will be seen as a hindrance and not a benefit to the goals of teaching. Another difficulty is introduced when access to a sufficient quantity of a resource is limited. This is often seen when the quantity of computers or digital cameras for classroom use is not enough to meet the needs of an entire classroom. It also occurs in less noticed forms such as limited access for technology exploration because of the high cost of technology and the fear of damages. In other cases, the inconvenience of resource placement is a hindrance, such as having to transport a classroom to a computer lab instead of having in-classroom computer access by means of technology such as laptop carts. Technology implementation can also be time consuming. There may be an initial setup or training time cost inherent in the use of certain technologies.

Even with these tasks accomplished, technology failure may occur during the activity and as a result teachers must have an alternative lesson ready. Another major issue arises because of the evolving nature of technology. New resources have to be designed and distributed whenever the technological platform has been changed.

Finding quality materials to support classroom objectives after such changes is often difficult even after they exist in sufficient quantity and teachers must design these resources on their own.

EDUCATIONAL TECHNOLOGY AND THE HUMANITIES

Research from the Alberta Initiative for School Improvement (AISI) indicates that inquiry and project-based approaches, combined with a focus on curriculum, effectively supports the infusion of educational technologies into the learning and teaching process.

TECHNOLOGY IN THE CLASSROOM

There are various types of technologies currently used in traditional classrooms.

Among these are:

- *Computer in the classroom*: Having a computer in the classroom is an asset to any teacher. With a computer in the classroom, teachers are able to demonstrate a new lesson, present new material, illustrate how to use new programmes, and show new websites.
- *Class website*: An easy way to display your student's work is to create a web page designed for your class. Once a web page is designed, teachers can post homework assignments, student work, famous quotes, trivia games, and so much more. In today's society, children know how to use the computer and navigate their way through a website, so why not give them one where they can be a published author. Just be careful as most districts maintain strong policies to manage official websites for a school or classroom. Also, most school districts provide teacher webpages that can easily be viewed through the school district's website.
- *Class blogs and wikis*: There are a variety of Web 2.0 tools that are currently being implemented in the classroom. Blogs allow for students to maintain a running dialogue, such as a journal, thoughts, ideas, and assignments that also provide for student comment and reflection. Wikis are more group focused to allow multiple members of the group to edit a single document and create a truly collaborative and carefully edited finished product.
- *Wireless classroom microphones*: Noisy classrooms are a daily occurrence, and with the help of microphones, students are able to hear their teachers more clearly. Children learn better when they hear the teacher clearly. The benefit for teachers is that they no longer lose their voices at the end of the day.
- *Mobile devices*: Mobile devices such as clickers or smartphone can be used to enhance the experience in the classroom by providing the possibility for professors to get feedback.
- *SmartBoards*: An interactive whiteboard that provides touch control of computer applications. These enhance the experience in the classroom by showing anything that can be on a computer screen. This not only aids in visual learning, but it is interactive so the students can draw, write, or manipulate images on the SmartBoard.

- *Online media*: Streamed video websites can be utilized to enhance a classroom lesson (*e.g.*, United Streaming, Teacher Tube, *etc.*)

There are many other tools being utilized depending on the local school board and funds available. These may include: digital cameras, video cameras, interactive whiteboard tools, document cameras, or LCD projectors.

- *Podcasts*: Podcasting is a relatively new invention that allows anybody to publish files to the Internet where individuals can subscribe and receive new files from people by a subscription. The primary benefit of podcasting for educators is quite simple. It enables teachers to reach students through a medium that is both "cool" and a part of their daily lives. For a technology that only requires a computer, microphone and internet connection, podcasting has the capacity of advancing a student's education beyond the classroom. When students listen to the podcasts of other students as well as their own, they can quickly demonstrate their capacities to identify and define "quality." This can be a great tool for learning and developing literacy inside and outside the classroom. Podcasting can help sharpen students' vocabulary, writing, editing, public speaking, and presentation skills. Students will also learn skills that will be valuable in the working world, such as communication, time management, and problem-solving.

FLEXIBLE LEARNING

Flexible Learning is a set of educational philosophies and systems, concerned with providing learners with increased choice, convenience, and personalisation to suit the learner. In particular, flexible learning provides learners with choices about where, when, and how learning occurs. Sometimes also referred to as personalized learning. Flexible learning approaches are often designed using a full range of teaching and learning theories, philosophies and methods to provide students with opportunities to access information and expertise, contribute ideas and opinions, and correspond with other learners and mentors. This may occur through the use of internet-based tools such as Virtual Learning Environments (VLEs) or Learning Management Systems (LMSes), discussion boards or chat rooms; and may be designed as a “blended” approach, with content available electronically and remotely, as well as “face-to-face” classroom tutorials and lectures. While the majority of flexible learning programmes to date have taken advantage of computer-based systems (“E-learning”), the rapidly increase in the processing power and popularity of mobile digital devices has recently caused considerable interest in mobile learning - the use of mobile devices such as mobile phones, iPods, and Personal Digital Assistants (PDAs) to increase the mobility of learners and correspondingly enhance the flexibility of their learning.

HEUTAGOGY

In education, heutagogy, a concept coined by Stewart Hase of Southern Cross University, is the study of self-determined learning. The notion is an expansion and reinterpretation of andragogy, and it is possible to mistake it for the same. However, there are several differences between the two that mark the one from the other. Heutagogy places specific emphasis on learning how to learn, double loop learning, universal learning opportunities, a non-linear process, and true learner self-direction. So, for example, whereas andragogy focuses on the best ways for people to learn, heutagogy also requires that educational initiatives include the improvement of people's actual learning skills themselves, learning how to learn as well as just learning a given subject itself. Similarly, whereas andragogy focusses on structured education, in heutagogy all learning contexts, both formal and informal, are considered.

HYBRID COURSE

Hybrid courses blend face-to-face interaction such as in-class discussions, active group work, and live lectures with typically web-based educational technologies such as online course cartridges, assignments, discussion boards, and other web-assisted learning tools. The degree to which the design of hybrid courses utilize traditional classroom and online learning environments varies, being largely dependent on the subject matter and overall nature of a course. Regardless of design, such courses may be expected to deliver instruction in both an asynchronous and synchronous manner, and are becoming increasingly prevalent in today's society. Important to note is that the term hybrid is not used often in the U.S., where the more common term for this kind of education is Blended learning.

HIGHER EDUCATION

Institutions of higher education choose a hybrid course delivery method for various reasons, including the following:

- Hybrid courses appeal to the market of busy working adults who choose to complete their college-level education beyond their late teens and early twenties. Hybrid courses allow these adults to fit occasional class time into their busy schedule while completing the remainder of the course work over the internet.
- Hybrid courses reduce pressure on university classrooms. The costs to build and maintain a university is high. Hybrid courses provide a solution to crowded classrooms, since much of the course work is completed on a virtual campus.
- They bring students together only where/when needed, allowing them to self study otherwise. For example, a chemistry course may require students to perform experiments in a physical laboratory; but the reading and writing of the course could be completed outside of the classroom.

Indeed, hybrid courses have been described as "the most prominent instructional delivery solution" since they provide the ever-growing and increasingly diverse academic world with the flexibility of fully online learning along with valuable collaboration achieved through face-to-face student-student and student-instructor interaction. A recently published meta-analysis conducted by the U.S., Department of Education indicates that a hybrid course design has the potential to enable instructors to offer students a greater range of learning avenues and uphold educational and academic design standards, even when instructing large classes and non-traditional students living sizable distances away from campus.

As a consequence of the latter, institutions of a higher education implement hybrid designs as a cost-effective strategy, utilizing staff and resources as effectively and efficiently as possible while standardizing the learning experience and relieving instructor discomfort generated by the larger traditional classroom environment. However, an important and realistic consideration is the difficulty sometimes generated in the development of hybrid courses which requires instructors to sacrifice their autonomy in teaching in order to work with instructional design experts. This along with other issues may lead to a large initial expenditure in time and resources.

TRAINING

With a rationale similar to higher education, government, non profit and the private sectors are more frequently using hybrid courses. These range from a course designed for a new employee and their supervisor to the annual company training to certification requirements that may require both academic, hands on work, with face to face interaction.

LIFELONG LEARNING

Lifelong learning is the continuous building of skills and knowledge throughout the life of an individual. It occurs through experiences encountered in the course of a lifetime. These experiences could be formal (training, counseling, tutoring, mentorship, apprenticeship, higher education, *etc.*) or informal (experiences, situations, *etc.*) Lifelong learning, also known as LLL, is the "lifelong, voluntary, and self-motivated" pursuit of knowledge for either personal or professional reasons. As such, it not only enhances social inclusion, active citizenship and personal development, but also competitiveness and employability. From Harper Collins Dictionary: (Social Science/Education) Lifelong Learning is the provision or use of both formal and informal learning opportunities throughout people's lives in order to foster the continuous development and improvement of the knowledge and skills needed for employment and personal fulfillment.

It shares mixed connotations with other educational concepts, like Adult Education, Training, continuing education, permanent education and other terms that relate to learning beyond the formal educational system Lifelong education

means education resulting from integration of formal, non-formal, and informal education so as to create ability for continuous lifelong development of quality of life. Learning is therefore part of life which takes place at all times and in all places. It is a continuous lifelong process, going on from birth to the end of our life, beginning with learning from families, communities, schools, religious institutions, workplaces, *etc.*

Learning of the 6 - 24 age group primarily takes place in educational institutions, from primary and secondary to tertiary levels. Family life, social organizations, religious institutions, and mass media can also play a role in non-formal and informal learning during this time. The objective of learning in this period is the holistic development of learners in four aspects, namely: physical, intellectual, social capacity, emotional and mental development. Learning during the working life of the 25 - 60 age group can learn informally through the use of instructional media, mostly from their occupations, work-places, colleagues, touring, mass media, information technologies, environment and nature. Adults learn from experiences and problem solving.

They therefore need continuous development of intellect, capability and integrity.Learning in old age (over 60 years old) elderly people can learn a great deal from activities suitable to their age *e.g.*, art, music, sports for the elderly, handicrafts and social work. They are highly respected in Thai society; capable of searching for knowledge and provide intellectual support to local communities. They can also carry out voluntary work in community organizations, clubs and associations. Such work makes their lives meaningful as well as bringing benefits to society.

MEDIA PSYCHOLOGY

Media Psychology seeks an understanding of how people perceive, interpret, use, and respond to a media-rich world. In doing so, media psychologists can identify potential benefits and problems and promote the development of positive media. The study of Media psychology emerged as an academic and professional discipline due to a social and commercial demand for the application of psychological theory and research into the impact of media and emerging media technologies both academic and non-academic settings. Psychology is fundamental to understanding the impact on individuals and groups of the integration of media technologies in our society.

This field encompasses the full range of human experience of media-including affect, cognition, and bahaviour-in activities, events, theories, and practices. Media include all forms of mediated communication, such as pictures, sound, graphics, content and emerging technologies. The emerging field represented a significant opportunity to use media in new and creative ways by understanding how psychology and media work together. Psychological theories can be applied to emerging social media, e-Learning, and digital technologies in pioneering ways. Media psychology draws from multiples disciplines such as sociology, anthropology, neuroscience, political science, rhetorics, computer science,

communications, and international relations. The APA Media Psychology Division 46 of the American Psychological Association now defines its purpose as focusing on the roles psychologists play in various aspects of the media, including traditional and new technologies. It seeks to promote research into the impact of media on human bahaviour and understanding media use; to facilitate interaction between psychology and media representatives; to enrich the teaching, training, and practice of media psychology; to encourage the use of psychological theory and expertise to the development of media across a wide array of applications such as education and healthcare; and to prepare psychologists to interpret psychological research to the lay public and to other professionals. It also expands the field to include the application of psychology to media by anyone working in the area and specifically applying psychology in media related situations. The 1998 APA Media Psychology Division 46 Task Force Report on Psychology and New Technologies broadened the definition of media psychology, set the stage for media psychology to become a more widely researched area and led to the establishment of new university programmes in media psychology. The Ph.D programme at Fielding Graduate University, the UCLA/Fielding MA degree partnership in Media Psychology and Social Change and the Touro University Worldwide MA degree programme in Media and Communications Psychology are examples. It is now being widely recognized that all media affecting human bahaviour does so through communication and media and communications psychology have become blended areas of research leading to increasingly valuable insights.

MICROLEARNING

Microlearning deals with relatively small learning units and short-term learning activities. Generally, the term "microlearning" refers to micro-perspectives in the context of learning, education and training. More frequently, the term is used in the domain of e-learning and related fields in the sense of a new paradigmatic perspective on learning processes in mediated environments on micro levels. In a wide sense, microlearning can be understood as a metaphor which refers to micro aspects of a variety of learning models, concepts and processes.

"No matter if learning refers to the process of building up and organizing knowledge, to the change of behaviour, of attitudes, of values, of mental abilities, of cognitive structures, of emotional reactions, of action patterns or of societal dimensions, in all cases we have the possibility to consider micro, meso and macro aspects of the various views on more or less persisting changes and sustainable alterations of performances." Depending on frames and domains of reference, micro, meso and macro aspects vary. They are relational concepts.

For example, in the context of language learning, one might think of micro aspects in terms of vocabularies, phrases, sentences, and distinguish them from situations and episodes (meso aspects) and socio-cultural specifics or complex semantics (macro aspects). In a more general discourse on learning, one might

differentiate between the learning of individuals, group learning or learning of organizations and the learning of generations or societies. Furthermore, microlearning marks a transition from common models of learning towards micro perspectives on and the significance of micro dimensions in the process of learning.

The microlearning approach is an emergent paradigm, so there are no hard definitions or coherent uses of the term yet. However, the growing focus on microlearning activities can be seen by web users' activities on the subject, who tag their corresponding weblog postings and social bookmarks with the term "microlearning". As an instructional technology, microlearning focuses on the design of microlearning activities through micro steps in digital media environments, which already is a daily reality for today's knowledge workers.

These activities can be incorporated in learner's daily routines and tasks. Unlike "traditional" e-learning approaches, microlearning often tends towards push technology through push media, which reduces the cognitive load on the learners. Therefore, the selection of micro learning objects and also pace and timing of microlearning activities are of importance for didactical designs.

Microlearning can be characterized as follows:

- Microlearning processes often derive from interaction with microcontent, which takes place either in designed (media) settings (e-learning) or in emergent microcontent structures like weblog postings or social bookmark managers on the World Wide Web.
- Microlearning can be an assumption about the time needed to solve a learning task, for example answering a question, memorizing an information item, or finding a needed resource. Learning processes that have been called "microlearning" can cover a span from few seconds (*e.g.*, in mobile learning) up to 15 minutes or more. There is some relation to the term microteaching, which is an established practice in teacher education.
- Microlearning can also be understood as a process of subsequent, "short" learning activities, *i.e.*, learning through interaction with microcontent objects in small timeframes. In this case, the design, selection, feedback and pacing of repeated or otherwise "chained" microlearning tasks comes into view.
- In a wider sense, microlearning is a term that can be used to describe the way more and more people are actually doing informal learning and gaining knowledge in microcontent, micromedia or multitasking environments (microcosm), especially those that become increasingly based on Web 2.0 and wireless web technologies. In this wider sense, the borders between microlearning and the complementary concept of microknowledge are blurring.

The following dimensions can be used to describe or design microlearning activities:

- *Time*: Relatively short effort, operating expense, degree of time consumption, measurable time, subjective time, *etc.*
- *Content*: Small or very small units, narrow topics, rather simple issues, *etc.*
- *Curriculum*: Small part of curricular setting, parts of modules, elements of informal learning, *etc.*
- *Form*: Fragments, facets, episodes, "knowledge nuggets", skill elements, *etc.*
- *Process*: Separate, concomitant or actual, situated or integrated activities, iterative method, attention management, awareness (getting into or being in a process), *etc.*
- *Mediality*: Print media, electronic media, mono-media vs. multi-media, (inter-)mediated forms, *etc.*
- *Learning type*: Repetitive, activist, reflective, pragmatist, conceptionalist, constructivist, connectivist, bahaviourist; also: action learning, classroom learning, corporate learning, *etc.*

MICROLECTURE

The term microlecture is used not to refer to microcontent for microlearning, but to actual instructional content that is formatted for online and mobile learning using a constructivist approach. More specifically, as described in the Chronicle of Higher Education, these are approximately 60 second presentations with a specific structure. They are not just brief (one minute) presentations: although Dr. McGrew had success with "one minute lectures" at the University of Northern Iowa as did Dr. Kee at the University of Leeds. David M. Penrose (aka the One Minute Professor), the Senior Instructional Designer and Manager of Online Services at San Juan College, of SunGard Higher Education has articulated the process for creating these microlectures.

As stated, these specific lectures are combined with specific activities designed to promote the epistemic engagement of the learner. The response of the Higher Education community was mixed, with some positive and some negative.

The interest surrounding the use of microlectures has continued to grow, even outside of the United States, to places like Hong Kong University. In the United States, the use of microlectures are even considered a vital part of the Pandemic Response Plans. Additionally, even scholars at schools like Princeton University (Humanities Resource Centre) and UNC's School of Government support the importance of an innovative teaching-learning approach for learners in the 21st century.

PRECONDITIONS OF E-LEARNING

E-learning, like any organized educational activity is a very complex undertaking. Many organizations seeking to engage in e-learning activities quite often overlook the fact that its successful deployment requires the same level of diligence and rigour in its planning, management and implementation that is necessary in setting up conventional education systems.

In fact, e-learning has added elements such as the technology infrastructure that require attention far beyond that is necessary in conventional educational settings. Furthermore, e-learning is neither a cheap nor an easy educational option. It does not offer a quick fix for problems associated with dwindling enrollments, distance education, or poor teaching and learning. Lack of careful planning and implementation of e-learning can actually lead to decreasing standards and morale, poor performance in learning and teaching, and wasted resources and loss of revenue.

Any efforts to embark on e-learning must be preceded by very careful planning. This would necessarily comprise, strategic and operational planning that are consistent with the values, mission and goals of an organization. Educational organizations that have a history of employing alternative approaches to learning and teaching such as distance education will have many of the prerequisites and dispositions for e-learning already in place which they can easily capitalize and build upon.

However, conventional campus-based educational organizations that have traditionally relied on residential face-to-face classroom-based learning and teaching activity would need to reconsider their values, mission and goals of educational provision in order to adequately accommodate the adoption of e-learning activities. A critical component of this orienting or reorienting for the successful adoption of e-learning is institutional sponsorship.

For e-learning to succeed in any setting, there has to be complete support for the initiative from the highest levels. This is important not only because it will have implications for funding allocation for any such new initiative, but also because of its implications for the mindset of the rest of the organization. Staff needs to buy into the initiative and be committed to its success.

Without this kind of a ground swell of support and commitment from its foot solders, any such new initiative is doomed for failure in any organization. These are the preconditions for the successful deployment of e-learning, and they have to be in place as part of the preparation for its deployment in any organization. Without adequate attention to these preconditions, e-learning is unlikely to achieve its full potential in any organization, no matter how robust and reliable is its technology and the infrastructure to support it.

ADMINISTRATIVE REQUIREMENTS OF E-LEARNING

Like any organized educational activity, e-learning needs to be very systemically managed. Foremost this will include attention to the technology and the infrastructure that is necessary to support it. It will include different

approaches to course design and development and strategies for generating and managing subject matter content from that which is suitable in conventional educational settings.

The Technology

While this is crucial to the success of any e-learning activity, technology is not the driver of the initiative. It is there to serve an educational function and such, it is a tool for learning and teaching. However, it has to be robust, reliable and affordable. It is critical to ensure that this is so, just as it is important to ensure that in a classroom-based educational setting, the classroom is available and it is comfortable, and it has the necessary equipment such as tables and chairs and other tools for teaching and learning to take place.

Most teachers and students in such educational settings would take these facilities for granted and they will be unaware of what goes on behind the scenes to ensure that the classroom setting works in the way in which it is expected to work. Staff and students alike would be very agitated if the computer, the projector, or the lights in the classroom did not work, as that would be very disruptive to their learning and teaching activities.

In the same way e-learning technology needs to work just as transparently and fluidly to allow teachers and students to concentrate on learning and teaching and not be distracted by the technology. If teachers and students have to be taught to operate this technology, then there should be processes and programmes in place for this training to occur, routinely.

Course Design and Development

Like any other organized educational activity, e-learning, is a team effort, as a number of people and a range of expertise need to be brought together to make e-learning work. In conventional educational systems, course design and development is the sole responsibility of the subject matter expert who is also the teacher. E-learning will require the delivery of that subject matter content in alternative forms such as online or on a CD-ROM. Some teachers are able to produce their content themselves.

However, this might not be the best use of their time and expertise in most educational settings. A more efficient and effective model of course development is the team approach, which brings together people with subject matter knowledge and expertise in the development of technology enhanced learning materials. However, the establishment and nurturing of such a team process is not to be taken lightly as it has implications on where the boundaries lie for various types of expertise and on the costs of supporting it across a large organization.

Subject Matter Content Management

In conventional educational settings, the generation and presentation of the subject matter content is the sole responsibility of the teacher. In e-learning,

while the teacher may still be generating this content, for it to be made accessible to the learners, it needs to be modified, enhanced and presented in a form that is amenable to the technology that is in use. Content once generated will need to be updated in order to retain its currency and relevance.

For this to happen, academic staff and other content developers will need expert assistance with learning and instructional design activities. They will need to be supported in the design and development of such self-study materials in alternative media forms. Permissions will be required in the form of copyright clearance to publish some of this material in such form. In large educational settings, this will create a substantial amount of work, which will require enough trained staff and appropriate procedures and processes.

IMPLEMENTATION REQUIREMENTS OF E-LEARNING

In conventional classroom-based educational settings, teachers spend a great deal of their teaching time in subject matter content presentation. This activity usually takes the form of lectures where teachers go through a body of subject matter content. Students on the other hand, spend a great deal of their study time in sitting in lectures taking down lecture notes. Irrespective of whether this is a good or bad educational practice; it is certainly an inefficient and ineffective use of teachers' and students' time.

If subject matter content needs to be presented, then there are surely several more efficient and effective ways of presenting it. Sitting students down in a lecture room and having them take down notes, often not so accurately, is certainly not one of those ways. E-learning, with its use of information and communications technology, enables the presentation of subject matter content in alternative forms, as such freeing up lecture time which can now be more usefully devoted to the facilitation and support of learning activity. However, e-learning in itself does not guarantee efficient or effective learning and teaching.

For it to be efficient and effective, a great deal of care and attention needs to go into its implementation. This comprises attention to the recruitment and registration of students, facilitating and supporting learning, assessing learning outcomes, providing feedback to learners, evaluating the impacts of e-learning on the organization, and a host of other issues related to these functions.

Student Registration

Most educational and training organizations have rigorous systems and processes in place to manage student registrations and their graduation. Those who choose to adopt on-line learning would want to also ensure that they are able to recruit, registrar and manage their students online in the fashion of e-commerce and e-business.

Doing so would be consistent with an ethos and philosophy of making one's registration processes accessible online. This would require administrative systems to be in place and that the staff members are appropriately trained.

Learner Support

In the context of e-learning, learner support takes on an added importance, as learners become separated in time and place from the teacher and the educational organization. This does not mean that necessarily more learner support is required. What changes is how learner support is provided, where and when and how often it is provided and who provides it. An online learning course, may not be supported and facilitated by those who developed these courses.

Assessment of Learning and the Provision of Feedback

While in e-learning, the fundamental and guiding principles of assessment of learning outcomes and providing feedback on learning remains the same as that for any other educational setting, what changes is how some of the learning outcomes can and might be assessed and also how feedback may be provided. Most educational settings must also deal equitably and fairly with unfair practices such as plagiarism and authenticity of student work. E-learning because of the flexibility it affords in terms of time and space independence are more prone to unfair learning and assessment practices. Opportunities for these occurrences need to be properly managed.

Evaluation of the Impacts of E-learning

It is crucial to have processes in place for knowing how you are doing with what you have initiated. This will include how your staff and students are engaging in e-learning. Without this kind of evidence, you are in no position to know how you might be traveling and what changes and/or improvements are necessary.

Evaluation of impacts is often neglected or inefficiently carried out in most educational settings. Evaluation of the impacts of your processes should be closely integrated into the planning and implementation of any e-learning activity.

7

Digital Learning

Universities will be busy this year adapting to the changes introduced by the government's higher education reforms. But they mustn't forget that there is more to the future of higher education than the teaching excellence framework ratings exercise: digital learning will also take centre stage.

Digital learning is growing in sophistication. It can be developed for fully online remote learning courses, or added to traditional classroom-based courses as blended learning. But how do you ensure it adds value, and avoid the risk of miscommunication?

As an instructional designer, one of the most common things I hear when meeting with academics is that their students don't engage with online activities. There are a number of reasons for this, but the most fundamental is that they see no reason to do it. If you want a student to engage in an online activity, you need to ensure they understand the task, and its meaning and relevance.

THE PROMISE OF ON-LINE EDUCATION

Over the past few years, connectivity to the Internet has improved dramatically. In British Columbia, every public school has Internet access, and the bandwidth, or rate of data flow continues to improve. Parallel to this development, nearly every household in the province is able to connect to the Internet. This means that virtually all computers can communicate with each other and raises some interesting questions about the future of on-line education.

What will the landscape of on-line education look like in the future? Will on-line education become a part of every school's curriculum, and will it be an effective way for students to learn how to become thoughtful and responsible citizens of tomorrow?

To take a meaningful role, on-line educational resources must become easy to use, effective, and contribute significantly to students' learning. In addition, teachers need training and support to integrate technology into their daily routines.

All too often, the technology arrives, only to gather dust and attain under-utilized obsolescence because people do not know how to use it, or it is too unreliable or complicated to be integrated effectively into daily routines.

Industry Embraces On-line Training

Much of private industry has already embraced on-line training and many corporate education programmes use on-line delivery systems. Corporate websites proliferate on the Internet and many contain password-protected employee training.

There is, however, a fundamental difference between corporate and public education. Large firms have very definite procedures and processes that must be learned by employees, creating a top-down educational structure. Corporations want people who are creative problem-solvers, but their education programmes are mostly concerned with corporate facts and procedures.

Employees can certainly solve problems using the Internet, and as bandwidth increases, on-line video solutions will enable corporations to provide more direct personal assistance to their clients. Client assistance should not be confused with employee training on products and services. As a result, corporate educational systems are often quite rigid, concerned primarily with the learning of specific facts and processes.

Public Schools—A Different Mandate

Public education has a far broader mandate. Schools are charged with the task of providing a complete educational package for the citizens of tomorrow. Children should learn the basics, but they should also learn to become creative problem-solvers and responsible citizens.

Computers are incredibly versatile and powerful learning tools, however they are just tools and should not be considered the primary vehicle for a child's education. Activities such as playing an instrument, modelling and making things, carrying out a science experiment, playing sports, discussing issues, and interacting with others all have educational worth and should not be sacrificed to singular computer-based activities.

We are living in the Information Age and facts are a mouse-click away. The total amount of information in the world is increasing at an astounding rate. We need to learn how to access those facts, make critical evaluations of the integrity of what we discover, and incorporate what we have found into our learning. We do not need to learn facts for their own sake.

Since the dawn of public education, every student in Britain learned that the Battle of Hastings took place in 1066. Other than for game shows like Jeopardy, this has little educational value, yet many continue to place Dickensian emphasis on learning facts rather than learning how to access and evaluate on-line research.

The arch-pragmatist, Thomas Gradgrind in Hard Times said, "Now, what I want is, Facts. Teach these boys and girls nothing but Facts. Facts alone are wanted in life. Plant nothing else, and root out everything else. You can only form the minds of reasoning animals upon Facts: nothing else will ever be of any service to them. This is the principle on which I bring up my own children, and this is the principle on which I bring up these children. Stick to Facts, sir!" Should we continue to espouse this dogma in the Information Age?

Companies Flex Their Muscles

The arena of commercial curriculum development for education is broadening. Many companies are flexing their muscles in the public education field. Cisco's CEO has recently called education the next "killer app".

We must ask if these companies have the background to provide effective public education. Many computer-learning systems focus simply on fact and regurgitation, with little focus on the learner. Concrete-sequential styles of learning are the legacy of private industry where training on specific applications pursues a narrow set of outcomes.

Curriculum developed by corporate entities for public education should, therefore, be regarded with suspicion. There is no substitute for the practical experience gained in the crucible of the classroom.

The Importance of Learning Styles

We all learn in different ways. Some people learn best by reading text and memorization, others learn by creating charts and diagrams, and others learn by discussion and interaction.

Howard Gardner, a proponent of Multiple Intelligences has identified eight different ways people learn. Gardner states, "According to Multiple Intelligences (MI) theory, all human beings possess at least eight forms of intelligence, which I call linguistic, logical-mathematical, (the two favoured in school), musical, spatial, bodily-kinesthetic, naturalist, interpersonal and intrapersonal."

For on-line education to be truly effective, all learning options should be addressed. Students should be given instructions on how to create solutions and then be able to choose how best to represent their learning. Technology has evolved to a point where all learning styles can be addressed. The linguistic learner, for example, can produce a word processed report, a logical-mathematical type may produce a database, chart or spreadsheet, a spatial learner might create electronic posters and models while the interpersonal learner may create sound files of a speech or interact through direct video connection. In addition, because we possess all these learning styles to some extent, individual learners should be encouraged to represent their learning in a variety of ways.

The Critical Questions to Consider

There are many challenges associated with the creation of multi-faceted on-line learning packages. The starting point is to consider the learning situation.

Is the student doing a single course on-line at a regular school? Is the student at home? Does the student have special needs? Is the student gifted or struggling with scholastic achievement?

All of these questions indicate that on-line curriculum design must be versatile and flexible. Many developers disregard the situation of the client and focus entirely on the delivery side of the equation. This error is often evident in beginning teachers who focus on the lesson delivery without sufficient consideration of what their students are doing or what they are capable of doing.

The activities in a typical on-line curriculum package must provide many options to fulfil learning outcomes in a variety of ways. The different options must also involve a similar amount of effort on the part of the student, so an "easy out" solution is avoided. Many current systems depend too heavily upon the question and answer or multiple-choice method of instruction. There must be a drastic departure from this approach. Curriculum must ask students to be both creative and critical thinkers when solving curricular challenges.

When a student makes an electronic representation such as a chart or a spreadsheet, far greater commitment is made to the solution than a quick one-line sentence answer (or paragraph for that matter) in an electronic workbook. The representation is an expression of the student, and ultimately an expression of their learning. When students create electronic solutions that are their own, there is ownership and pride.

The Importance of Balance

In their enthusiasm for using technology, educators often overlook non-digital activities that work just fine to convey learning and can perhaps better adapt to different learning situations. George Brackett writes, "Only when a technology allows us to reach an existing goal more effectively, should we consider using it. It's a mistake to put technology centre-stage as we plan and execute educational reforms. Technology should hover shyly in the wings, ready to lend its power, but only as needed." The need for a balance between virtual and real time learning must be recognized. On-line learning should be perceived as a component of a day involving activities other than computer-based learning. The directions, management and recording of student achievement can all be on-line, but the student's day should incorporate far more than sitting in front of a computer screen all day long, doing activities which could just as easily and perhaps more effectively be done in non-digital ways.

Best Practice?

So what should a typical on-line course design incorporate? A duplication of traditional paper-based courses does little to harness the potential of technology as a learning tool. Currently, the majority of on-line courses fall under this category and only serve to provide convenience for learning, or worse yet, a means of downloading a paper course for printing. While this has some value, it is a mere fraction of the potential which electronic learning brings to the table.

Multiple choice or fact-based on-line questions add very little and may even reduce the effectiveness of learning as in this context, electronic courses offer a diminished experience for students.

Lowell Monke, a leading developer of virtual education projects for over eight years has some misgivings about on-line learning. Monke states, "Any time we start doing telecommunication as a means of education, we enter an environment that is extremely diminished."

In many on-line courses, the interaction, discussion and development of solutions is lost as the learner plows through boring activities that do not encourage either imagination or creativity. What new things are students learning from courses such as these?

Curriculum developers must have a clear sense about their clients. Rather than developing server-based, canned learning experiences, educators need to focus on client-side creativity. Curricular packages should provide resources that elegantly combine varied opportunities to represent learning. Students should be trained with skill-building technology activities which teach them how to solve curricular challenges. There should be a focus on productivity software that enables students to create their own solutions rather than responding to "framed" curriculum, where there is little opportunity to think critically.

Having a student prepare and upload a presentation, a slide show, an electronic poster, a chart, a graph, a digital photo, or interact by streaming video has more educational worth than simply downloading a word processed document or web page and then typing out the "right answer".

Blind Alleys

Critics are quick to point out that addressing technological challenges without knowledge about how to use the tools of technology can be a frustrating and disjointed learning experience. Students can follow blind alleys, losing the original curricular intent as they wander through a maze of dialog boxes.

To solve this problem, technical training should be embedded within the curriculum to ensure a smooth learning path. There should be an almost zen-like approach to the brevity and effectiveness of technical instruction. Language should be as simple as possible, so all levels of readers can understand. The length of the instruction should be as short as possible, so the learner does not forget what they were using the tool for in the first place.

There should also be a quick escape back to the curricular challenge to make this instruction a seamless blend.

Just-in-time learning, where students see an educational challenge, and then discover ways to solve the problem, is the cornerstone of effective blending of technology and curriculum.

What is the point of learning how to perform a specific technological task if there is no context to which it can be applied?

Herein lies the challenge for on-line curriculum developers. Curriculum must address different learning styles, anticipate the needs of the learner, and provide seamless integration of learning opportunities for the required skills.

The Importance of Support and Adult Learning

We are in the embryonic stages of on-line curriculum development. A significant and ongoing problem is the ever-changing face of technology.

The Prospects?

So here we are with high speed networks, improving connectivity, improving technology and untrained personnel. Ironically, in this crisis, on-line education itself may come to the rescue.

Websites can provide educators with skill-building tutorial activities in web browsing, word processing suites, multimedia and graphics programmes. Samples of assignments and students' work should be linked to these skill-building tutorials so teachers can see what can be done with the learned skills.

If a focus is placed on productivity software rather than "narrow band" applications that focus on one area, teachers will learn a set of transferable skills, see student solutions using these skills and be able to apply these same skills to a broad range of topics. The principles of brevity and clarity in on-line tutorials apply for teachers just like students. There is a definite skill in design that must be applied if this on-line approach is to become a successful vehicle for distributed learning.

The path to successful integration of on-line learning is far from clear. Many questions still exist about different approaches that are being propounded, and there is no clear answer about which is more effective.

In *Failure to Connect*, Jane M. Healy points out, "We still await research telling us how-or even whether-software can best be used to teach either subject matter or skills...the research on software's effectiveness is still limited, vague, and open to questions."

The guiding principle therefore should be, "what are our students learning? Is this learning meaningful, and will it make responsible and caring citizens of tomorrow?" On-line learning will require huge amounts of energy, vision and dedication to be truly effective. The validity of the technology should be evaluated as we progress as many new developments look better than they actually are in an educational setting. As Yogi Berra once said, "You've got to be very careful if you don't know where you're going, because you might not get there."

But what did we learn?

Evaluation Procedures within the University Community and their On-line Variations

Generally, the University of Waterloo distributes course evaluations to students to obtain responses on the success of every course. Instructors distribute evaluations to on-campus students during the last scheduled class, while distance-education students are mailed the evaluation at the end of the term. In both cases the responses are anonymous, and the professor does not receive the

evaluation results until after the final marks are registered. Each faculty administers a variation of the form specific to its academic needs. Both the number and the range of the questions are limited.

For example, the distance-education evaluation is made up of nine questions dealing with presentation of course material, the course's ability to maintain student interest, the course organization, value of readings, fairness in grading, instructor feedback, and an overall evaluation of both the instructor and the course. Students may respond to these questions in the five categories of 'excellent', 'good', 'satisfactory', 'fair', and 'poor'. In addition, there are three 'comment' style questions dealing with the strengths and weaknesses of the course, and a general view of the course. In this way, this form is specific to distance-education needs.

By comparison, our on-line technical writing course incorporates the evaluation process throughout the course, allowing for a two-way dialogue to which the instructor can react, and the students witness responses to their suggestions. Instead of a single evaluation at the end of the term, students have the option to complete several evaluations throughout the course. These occur at times when their new skills and our grading of their work enable them to understand both their performance and our learning objectives in light of applied instruction.

In total, the students can respond to over one hundred questions. They receive the evaluations after each assignment is submitted but before the return of their graded work on-line. Such timing provides for more honest responses because the students are not influenced by their assignment marks. Evaluation responses are completely confidential. They are sent via e-mail to a designated computer account from which authorship cannot be traced.

These evaluations solicit information on most aspects of users' learning experience, participation, support and their sense of what the course provides, with its relevance to their expectations about their own training and understanding of the processes of technical documentation. We have synthesized the ranges of questions from five faculty models and resolved them to the new conditions of the electronic version of the course.

We have developed these evaluation procedures to elicit a comprehensive view of both real activity and student opinion about their learning process. We make modifications in content, course administration and requirements in light of the results of each term's survey and we try to show students the immediate good effects of their responses by announcing changes to procedures and materials.

These have given us clear evidence that students:

- Deem the on-line learning process to be highly effective as an academic exercise
- Perceive it to be comprehensive and integrated in application
- See its technology and theory as integrated into a useful set of tools for their scholarly and applied writing.

Course Design and Structures as Background for the Evaluation Process

The 4-month university course in technical writing, which we offer entirely on the Web as credit and certificate learning through the Department of English at the University of Waterloo. Our colleague, Dr. Katherine Schellenberg, has provided the extensive statistical planning and analysis which now form the bases for our evaluation methods.

The course consists of a web site with:

- Extensive content on technical writing techniques and standards.
- Integrated internal communication methods-e-mail, chat, newsgroups, Instructor Comments, on-line marking and the evaluation procedures which are the topic of this paper all available at the course site.
- The course's delivery engine, an SGML editor and converters, which enable students and instructors to create the entire range of course content on any topic or subject area.

We use these same tools to develop on-line materials for this and other courses and we incorporate appropriate student materials, (with their permission), in new aspects of the work.

Students complete five technical documents in a sequence of increasing complexity. They provide all other members of the course with a current resume and proposal letter, from which, by a process of inquiry and selection, all members form themselves into groups of three to complete the central 50 per cent of the exercise.

They work together to produce portions of a manual, on which they then conduct usability tests. They complete the course with an extended Report on an aspect of their learning experience, often related to the application of on-line techniques to other areas of their training and work. Students create all assignments in SGML and then convert them into HTML for on-line display to classmates and markers. A graded version of each assignment is returned to the student under a password for privacy. Members are encouraged, in chats and by tutorials, to look at their own work in the contexts of others' submissions and the instructor's remarks internally in their documents. Students retain and may distribute their materials as proof of their abilities in SGML and the creation of interactive learning. We provide references on students' request to potential employers and recommend members to companies seeking technical writers with these skills.

By the completion of the course each participant has experienced the major communications tools used in the creation and exchange of Web-based technical documents. Each has worked with and understood the mark-up and conversion issues surrounding SGML, RTF and HTML displays. Most have dealt with some of the requirements for full multimedia expression on CD-ROM, the Web or on Intranets for internal distribution. This is 'Technical Writing' in a very current

and complete sense and our students have been trained in it, individually and in groups, with all the resources our databases and course layout can provide. In the near future we plan to add optional services in audio and video interchange, XML document creation and Java authoring.

In effect, we have made a course in which the course materials and techniques are learned and used by participants even as they complete their writing assignments. By the conclusion of the course many members have the full capacity to create SGML-based interactive projects for inter- and Intranet expressions. for their own and their employers' uses. Most course materials have been available to the public at our web site and we continue to respond to inquiries and applications from individuals and companies on the Web. At the time of writing we are preparing a commercial version of our work, with certificate status for participants and an extended range of topics related to on-line learning and information exchange, to launch in fall of 1998.

FURTHER DEVELOPMENT OF INTEROPERABILITY SPECIFICATIONS AND STANDARDS

Since 1999 there has been the vast amount of work globally that has gone into developing an infrastructure for interoperability through the production and refinement of learning technology standards specifications, notably by the IMS Global Learning Consortium, although a number of other bodies are also involved. This work is seen by many in the field as essential to the future of e-learning by aiming to ensure that software systems can work with each other, that learning content and student information can be transported and reused and repositories can be searched using standard metadata.

According to Bill Olivier of CETIS, there are two main motivations for the development of interoperability standards. The first is portability of content and data exchange. If we buy or develop a piece of content we want it to run on a variety of different platforms The second is to lower the cost of systems integration by allowing existing systems to work with new e-learning systems. Without standards we are dependent on bespoke integration which is time consuming and expensive or lock-in to proprietary systems.

It may seem that we have started to peel off on a technology tangent here and that we have forgotten that the point of this chapter is about enhancing the quality of teaching and learning but we haven't done either of these. Let us re-iterate a point that is central to this report: technology should adapt to fit teaching not the other way round. So by implementing interoperability standards, it may be possible to put together different e-learning tools for different contexts within the same institution, the same department or even the same module. This would allow different subject departments, for example, to choose different e-learning tools that suit the particular teaching approach, instead of having to use the institution's chosen VLE. The aim is to put control of how teaching happens back into the hands of the educator not the software designer.

Importantly, work in defining agreed technical standards for data interchange means that small to medium content providers and software developers can compete effectively with the big players and lock–in to proprietary systems can be avoided, where once one major system has been adopted, it becomes impossible to migrate to another without major costs being incurred to transfer (or re-enter) data that has been saved in a proprietary format. Interoperability allows systems from different vendors to work together (interoperate), and as a consequence, has paved the way for the development of open frameworks for e-learning. The idea of these is that instead of having to buy into a single monolithic VLE application institutions will be able to put together a variety of lower-level components which will provide more flexibility and better suit their e-learning needs.

Open Frameworks and e-Learning Architectures

This latest set of developments has been inspired by the shortcomings of the one-size-fits-all model of current VLEs we have outlined already. Educational technologists feel that there needs to be an alternative that can reduce costs by permitting a saving on the license fees charged by software vendors for their systems and at the same time provide more flexibility control over teaching and learning processes.

Already some in the development world feel that the time of the 1st generation of VLEs as typified by the currently popular applications is coming to an end and the future lies in the development of component-based architectures. The pace of development in learning technology means that architectures must be adaptable and easy to configure and reconfigure. These will give institutions greater flexibility, confidence and control over their own e-learning management.

Scott Wilson of CETIS draws a picture in which the situation today is characterised by the existence of giant components: A VLE/LMS component, one or more MIS components, a library component, *etc.* The aim of recent MLE integration attempts has been to get these large-scale components exchanging data and working together. As Scott explains, this is inefficient because many common services are replicated. An example is the number of times users have to sign on to institutional systems – the library system, the VLE and student information systems often all require the user to log on separately, since each system has its own authentication system. If we break these down into smaller components (*e.g.*, have a separate authentication component that is linked to all the other systems) and provide a coherent architecture and standards-based data exchange then the common services can be separated out to create a more efficient modular system. IMS have described an abstract framework for e-learning architectures. It is a layered architecture with a 'sea' of available components at the bottom layer. The middleware of the architecture consists of layers 2 and 3, which implement the common, services and application services. At the top level are E-learning applications, which use objects and services defined at lower-levels of the architecture.

One of the main contributors to this work is the Open Knowledge Initiative (OKI). Founded at MIT in 2001, the OKI is a collaborative project to produce an open and extensible architecture in which e-learning components can be embedded and communicate with each other and external enterprise software. Phase 1 of the project is due to complete in July 2003 with delivery of a set of Open Service Interface Definitions (OSIDs) to specify interactions between services both within and across institutions, a reference implementation of each service with open-source code and two open-source learning management systems – Stellar and Coursework.

Inherent in the idea of an open architecture is a foundation on the open standards specifications and the development of open-source components that conform to the standards. In order to assist these two streams of development moving forwards together there is a strong relationship between IMS and OKI made concrete in a memorandum of understanding between the two projects.

This is an exciting strand of development as it lays the foundations for the design of pedagogically effective systems suited to specific demands of individual institutions and courses. It both obviates the need to purchase a single VLE for an entire institution and opens the door to portable content and student data.

The optimism surrounding open-standards and the development of common frameworks for e-learning has to be tempered by the understanding that there remain difficult technical and organisational problems with both the transport and reuse of learning activities at the e-learning level and the top-down approach involving the specification of educational interoperability standards that meet needs across the industry. The identification of common architectures for core services is one thing, but producing an open framework that can accommodate the interactions and fine granularity components at the level of educational applications has not yet been addressed. While this approach offers considerable hope for the future there is a long journey still ahead.

A complementary approach is the work of developer and practitioner communities working with the growing number of open-source products producing add-on tools and custom integrations to fit a wide variety of contexts where standards have not yet been specified or are in the process of evolving. This work in turn has much to contribute to the continued development and refinement of standards and to further understanding about what is educationally useful in e-learning. What is important is that the educational community understands that it is part of this development process and has its opportunity now to make its contribution to these developments. Both JISC and CETIS have discussion forums and run events in which the community at large is invited to contribute opinions about how to bring teaching and learning into the centre of e-learning development. This report is intended to be one contribution to that process.

The Revised Pedagogical Structure

The principle aim of this chapter is to review and extend the framework for pedagogical evaluation of e-learning tools that was presented in 1999. The contribution of each of these models to the framework and the discuss issues that emerged when they were applied to VLEs.

Overview of the Pedagogical Framework

Our aim in providing this framework is to help readers to analyse e-Learning tools without being distracted by the details of user interface objects and components.

While these are of some importance in the user experience, it is the workflows that are facilitated by these that need to be focused on. The framework provides a means by which reflection on aspects of pedagogical process can be structured, and then how e-learning systems encourage or discourage these can be evaluated.

We would stress, however, that the framework does not seek to provide a "true" evaluation of e-learning tools and systems; there inevitably remains an interpretive aspect. The framework does, however, provide a means by which discussion about specific process aspects of tools and systems can take place in a structured way, and hopefully result in better choices and design decisions.

Education providers using VLEs and other ICT tools for e-learning have two primary aims:

- To enhance the quality of teaching and learning by allowing teachers to use pedagogies that are not possible with large numbers in a face to face environment
- To manage the delivery and administration of programmes of learning through an electronic (on-line) medium. This includes management of groups of students.

The first of these is a more difficult problem, but (perhaps as a consequence of this) much more effort so far has been put into the second.

We suggest as a result of the work conducted in developing the pedagogical framework in 1999 that these two aims are intrinsically linked and that HOW a particular VLE or e-learning platform or course management system is designed and constructed for the purposes of management can have a profound impact on how likely it is to constrain or facilitate the use of alternative pedagogies.

The framework as formulated in the 1999 report was constructed out of two different theoretical models: The conversational framework (Laurillard, 1993) which is a well-known model of effective teaching practice for academic learning and the Viable System Model (VSM) which is a model for the design and diagnosis of effective organisational structures drawn from management cybernetics.

These two models are complementary, with the first providing a model for incorporating effective teaching and learning practice into an e-learning environment and the second providing a number of criteria from an organizational perspective which influence whether the system will facilitate or inhibit the ease with which a pedagogic model such as the conversational model can be used within that system.

A concrete example will clarify our point. If a VLE is constructed on the basis that all learning activities have to be created and sequenced in advance of a course beginning, then there is no way that a teacher can create and add a

learning activity to the course on the basis of a preceding conversation at the level of concepts with the students (a basic idea of the conversational model).

Alternatively if all the students in one group are treated as belonging a single 'class' object to which learning activities are assigned in the VLE, then there is no possibility for creating individual learning activities.

In these examples design decisions in the creation of the VLE that have been made on the basis of a particular model of the management flow in the teaching and learning process directly affect the pedagogical flexibility of the environment.

Many first-time users of VLEs seek to adapt the way that they work to the way that the software needs things to be done. It is an ongoing abrasive feature of HCI that we should attempt to adapt to the software's preferred modus operandi rather than the other way around.

Happily most of the VLE vendors are much more aware of these sorts of criticisms than they were in 1999 and the systems that are around now are much more sophisticated than their earlier counterparts. Consequently, since it remains just as important that systems are critically appraised and that design features are evaluated to reveal their limitations and inconsistencies, the methods of evaluation need to become more sophisticated to match.

The Viable System Model

The VSM was described in a simplified way in the report of 1999. The aim was to elucidate enough of the model to show how and why it provides an extremely relevant and useful basis for the evaluation of VLEs, without overwhelming the reader with details of the theory on which it is based.

The key premise on which the VSM is based is that it is VARIETY that threatens to overwhelm organisations and it is this variety that needs to be managed by any organisation. This is particularly relevant to precisely those issues that education is facing today and that e-learning, it is hoped, will help alleviate. That is to say: how can the quality of educational provision be maintained in the face of increasing student numbers and increasing diversity. The cybernetic answer to this problem is that the variety of educational provision must be increased to match the increased variety presented by the environment. The VSM proposes a number of communication channels by which the variety of the controller might be increased. These channels were elaborated in the 1999 report to yield criteria for the evaluation of VLEs in the effective management of large numbers of students so that resource intensive pedagogic models such as the conversational model could be used in an e-learning context.

These criteria are:

- Resource negotiation
- Adaptation
- Self organisation
- Monitoring
- Individualisation

The relationship between a management system and a controlled system using these channels. In order to deepen our understanding of how the VSM can contribute to our depth of insight into how the design of e-learning management tools can affect pedagogical effectiveness; we need to elaborate this model in a few ways. Specifically we need to refer to two aspects of the VSM left out of the previous description for the sake of simplicity:

Recursive Properties of the VSM

Course management can be viewed from a number of perspectives or levels:

- Programme level
- Module level
- Individual level.

It is important to be specific about the level of teaching and learning activity we are talking about. One of the criticisms of the first generation of VLEs is that almost without exception they are centred on the activities at the module level. To be more precise they are designed around the interactions between teacher and learner and the administrative activities that occur at this level of granularity. They do not scale well to programme level activities at a more macro–level or, at a finer grained level of analysis, the activities of a single student.

As a tool of analysis the VSM is ideally equipped to accommodate changes in level of focus, as it is a basic mathematical feature of the model that the same general entities and relationships remain valid at any level of analysis. Whether it is a single organism or a global corporation or an entire national economy, the same general principles of viability are the same – *i.e.*, that the variety of the controller must match the variety of the system to be controlled. And at any level of analysis (so the model states) the same sub-systems and channels of control and coordination are involved in the process of managing variety. The model is inherently recursive.

CURRENT TRENDS AND FUTURE DIRECTIONS FOR E-LEARNING

What we might conclude from the above is that there has been an insufficient level of attention given to the nature of teaching and learning practice in e-learning developments to date. This is understandable since there have been major barriers to overcome in the form of implementing the technical infrastructure, professional training and getting staff and students on board with the idea of e-learning. We discuss ways in which current developments may help to establish a greater focus on teaching and learning in the future. In particular we focus on the following:

Learning Activities and Learning Design

We have presented above suggests that for pedagogical innovation using e-learning tools to become a reality, both software designers and educators alike

need to shift their thinking from a focus on course management to include the design of learning activities themselves. Significant steps have already begun to be taken in this direction in the development world. The first major contribution was the development of EML (educational modelling language) by Rob Koper and his colleagues at the OUNL in the Netherlands. The work involved in the development of EML has more recently fed into the construction of the IMS Learning Design Specification.

The development of EML which began 1998 was spurred by a dissatisfaction with several features of what we have thus far characterised here as the prevailing model of e-learning to date; that is a heavy focus on content or learning objects and an inclination towards information transmission as the overriding yet implicit pedagogical model.

The OUNL team, by contrast wanted to provide a language to explicitly model the interactions involved in a given teaching and learning situation so that this could be incorporated into the design of a learning activity. EML was developed as the notational system for modelling 'units of study', which is their abstraction of a learning activity (*e.g.*, a course, a module, a lesson etc).

This is a departure from the prevailing learning objects model of e-learning design, which is centred on units of content and metadata rather than units of activity. The major problem with the learning objects model, argue the EML designers, is that it fails to provide a coherent framework that can express semantic relationships between the learning objects in an educational context. EML is designed to provide a way to type objects according to their pedagogical use, derived from a pedagogical meta-model. The rationale behind the construction of the pedagogical meta-model is described in Koper (2001).

The main contribution of EML to the e-learning community at large is that it has played a core role in the development of the IMS learning design specification. The primary aim of the learning design specification is to allow teachers or designers to describe a learning design in a standardised way that means it could be 'run' in a variety of learning-design aware players or environments.

Unfortunately there are currently no environments that can take an existing learning design and run it, also there is a paucity of tools available to assist in creating a learning design. However, there are two recent developments that are worthy of mention here.

The first of these is LAMS (Learning Activity Management System) LAMS is a learning design inspired system for the creation and running of learning designs in the form of sequences of learning activities and is reviewed as part of this report

The second development in the space is the RELOAD project. This project funded under the JISC X4L Programme is engaged in producing tools for the creation, editing and running of both learning objects and learning activities that implement the appropriate IMS/SCORM specifications. The project is implementing IMS content packaging, simple sequencing and learning design specifications in a suite of open-source tools including a package editor based

on the existing PackageIt, a SCORM player for running SCORM 1.3 content and the Colloquia VLE. These two tools currently still in development point a new direction away from the primacy of content management in VLEs towards systems that make activity-centred learning design using interoperability standards a reality. There are still a variety of difficult technical issues to overcome in creating learning designs in one system and running them in another. However, the fact that this work is underway and is feeding into the further development of the interoperability specifications is a positive step.

Frameworks, Open-standards and Services

We look at current development efforts which may transform the e-learning landscape from one dominated by large scale components: the MIS system, the VLE, the library system etc into one where common services are shared between application components at a finer level of granularity.

Various initiatives are exploring the core common services of an e-learning architecture. These initiatives are working towards a common understanding of the technical framework required to underpin flexible, student-centred e-learning. Using a combination of (possibly open-source) components that communicate with each other by means of standardised interfaces (such as those provided by Web services) these developments could open up the field to a much wider range of pedagogical tools, which can be flexibly allocated to different contexts within an institution than is currently possible.

LEARNING ON AND OVER THE INTERNET

We live in a continuously shifting state of realities in which the only predictable constant is the inevitability of more change. This is the basic element of our Information Technology Era, which commenced with the development of the microprocessor (1973) and proceeds into the foreseeable future. The most recent impetus to microprocessor development, the convergence of technologies, is represented in embryonic form by the Internet, particularly the World Wide Web. This paper reports on the findings of an online investigation intended to explore the educational function of the Internet by analysing the ways learning opportunities are presented and utilised on and over it, in an attempt to understand the trends of changes in learning technology and how these changes affect adult learners.

Points of Departure: I based the planing of this investigation on reflecting on the observations made by Kirkup and Jones (1996) on open learning and distance education related to the concept and reality of a learning society. In particular, the issues raised in their chapter of whether new ICTs may "overcome the previous weakness of ODL without undermining its strengths", and that, in a learning society, learning opportunities should be open to "all classes of society, especially those people who have had less formal education than the majority, and what usually follows from (this) lower income", have been used as a measurement throughout the investigation.

THE INCREASING NUMBERS

Enrolment in all sectors of the education system has increased in recent years. It is estimated that "two trillion dollars or one-twentieth of global gross domestic product" is spent on education. Roughly speaking, one-fifth of this amount is being spent by the private sector while the rest is spent by governments on the public education system.

International and national campaigns such as "education for all" have succeeded in drawing learners into the education system, but the development of distance education opportunities has also had much to do with the growth in numbers. Research conducted by the International Data Corp indicate that "distance learning enrolments are growing by 33 per cent and will reach 2.23 million in 2001".

Many students are attracted by the prestige of off-shore degrees, and this trend it likely to continue as distance and virtual education continue to develop. In a recent travelling "road show" by three major U.S.-based universities, Lynne McNamara (Director of Programmes Development in Asia for the University of Maryland University College) projected that her university expects to have 70,000 to 80,000 online students by the end of 2001, many of them from Asia.

The private sector has also supported and been a driving force behind the increase in participation in distance and virtual education. Employees who want to advance their careers, but who can't afford to take the time out to study at contact institutions, are attracted to virtual learning opportunities. Many corporations recognise the benefits of supporting such studies: they save both in training-related travel expenses and in employee productivity.

THE IMPACT OF ICT

New technologies have made "the walls of the learning space transparent, providing a freedom for the learner to explore sources of information outside his institution, even outside his country". While ICT has undoubtedly opened new avenues for increased numbers of learners, it has also opened new areas of research focusing on the role of pedagogical processes when using new technologies and on their impact on cognition.

Kofi Anan, the United Nations Secretary General, has noted the broader impact of ICT, asserting that:

- Recent developments in the field of communication and information technology are indeed revolutionary in nature. Information and knowledge are expanding in quantity and accessibility. In many fields, future decisionmakers will be presented with unprecedented new tools for development. In such fields as agriculture, health, education, human resource and environmental management, or transport and business development, the consequences could be revolutionary. Communications and information technology have enormous potential, especially for developing countries, and in further sustainable development.

The use of ICT is a vital component of the new "information economy" and "information society." Mansell and Wehn also point out that the term "knowledge society" has enabled a shift away from technology as a driver of change to a tool that offers new ways of combining the information available with people who will drive development. This shift pressures countries to develop education systems that enable skilled people to work within the knowledge society and within the global economy. The result of such pressure on both developing and developed countries has been a massive increase in education and the drive for qualifications.

The rapid development of virtual education is most noticeable in the developed world where there is much greater access to educational institutions and learning technologies, especially computers, CD-ROMs and the Internet. In the developing world, limited access to ICT is apparent. A recent report by e-Marketer noted that only 229.8 million or 5% of the world's population is online. The report also notes that this number is likely to increase to 640.2 million by 2004, which will represent approximately 14% of the world's population. Figures from U.S., government officials are slightly more generous. They put the number of people connected to the Internet at 332 million, with only 1% living in Africa. And less than 5% of the computers connected to the Internet are in developing countries. The figures proposed by the International Data Corp estimate that by 2003, the number of Internet users worldwide will grow to about 508 million, up from 87 million in 1997.

As access increases, in the corporate world, companies will focus on their ability to exploit Internet and e-commerce opportunities. Employees will need to rapidly develop their knowledge and skills to use the technology and to re-design the business process. Many businesses will encourage in-house and distance education and training, and they will complement this with e-learning. One prediction suggests that by 2003, less that 30% of formal corporate learning programmes will employ the traditional classroom model.

Because the above projections were made prior to and during the crash of the technology market of 2000/2001, some argue that they are incorrect. However, the effect is likely to be minimal. Current research indicates that while the education market has "declined in tandem with other sectors that make up the Internet economy, the sector encompassing corporate e-learning providers and companies serving the K–12 and higher education markets hasn't suffered more than other sectors anchored in Internet technologies. Barron notes that many companies view e-learning as a strategic necessity that is vital in today's knowledge economy.

He goes further to note that e-learning and broader educational technology areas are faring relatively well in a slowing economy.

LIMITS TO ACCESS

While ICT makes it possible for many potential learners in many parts of developing countries, including remote and rural areas, to have access to education, such access is very limited.

There are a number of technological constraints that restrict virtual education. For one, the telecommunications infrastructure (telephone and other communication facilities) outside many of the major cities in developing countries are limited and inadequate.

A few examples show the problem:

- Africa has approximately 12% of the world's population, but only 2% of the global telephone network. Telephone density is less than two lines per 1000 people. These figures become even more startling when compared with Asia (48 per 1000), America (280 per 1000), Europe (314 per 1000) and high-income countries (520 per 1000).
- Nigeria is the most populous country on the African continent. However, the services provided by its state-run phone company, NITEL, are meagre for a country of 108 million people. In terms of the Internet, there are fewer than 500,000 lines connected.
- Internet reach in India doubled from a subscriber base of one million to over two million within six months in 2000. However, when this impressive figure is matched against the total population of India of one billion, you get the sense of the magnitude of the lack of access to computers and the Internet.
- The situation in Latin America indicates huge disparities. In the mid-1990s, few people in South America, rich or poor, owned a computer or had access to the Internet. The changes have been dramatic over the last few years. Now 35 million Latin Americans own PCs and 20 million use the Internet, but the poor have been largely left out of this development. In Brazil, for example, 72% of the 7.7 million Internet users are from the wealthiest fifth of society, with only 8% coming from the poorest fifth.

Both developing and developed communities have responded in different ways to these and other constraining factors to virtual education. One key response has been to redefine the nature and function of learning venues that enable virtual education.

THE TRADITIONAL NATURE OF LEARNING VENUES

The world is changing rapidly in all areas - in the environment, in the economy, in technology and in education. While it is important to spend time pondering the implications of such change, perhaps it is more important to consider the implications of the changes to education. The education system should be the key platform that enables young people to develop the necessary skills required to prepare for the changing world. The introduction of ICT to support virtual education

has generated a range of discussion, generally focusing on the value of using the technology for this form of education delivery. Often such discussion shows a lack of unanimity on the issues that need to be addressed for the effective use of technology to support virtual education. However, there are three issues that seem to generate consensus by all people involved in education: costs, decision-making and access.

The COL study on virtual institutions noted that the lack of access to learning venues and the lack of access to connectivity and learning technologies within venues was a major constraint, particularly in developing countries. And it is this element of education, the "place" of the educational interaction, that is increasingly being seen as crucial to promoting access to virtual education.

In focusing on learning venues, a range of vital questions should be considered to guide the thinking on the spatial and social construction of such venues.

These include:

- What are the implications for learning where students are able to access second opinions and further information to that provided by the textbook and teacher? How can the student access such opinions and information and what technology will best serve this purpose?
- What will the role of the teacher be in the context of different learning venues and environments? When does the teacher become the author, the expert, the tutor, the presenter and the facilitator? What learning space is required to enable the teacher to carry out these tasks?
- Increasingly there is a shift away from a class defined only by age to individually tailored education based on the requirements of each student. Using resource-based methods, institutions are able to cater to different students in terms of their capabilities, potential and stage of learning maturity. What are the implications of this for peer group relations, teachers, tutors and librarians? What are the implications in terms of the nature of the learning venue and its physical construction and its resources?
- Shifting away from mass groups of students to individual learning requires administrative and resource control systems that enable such learning to occur. What are the implications of this type of system for the learning space necessary for the learner to be successful?

Such questions pose interesting considerations on the nature of the learning structure. The “buildings” may be a school; or part of other public buildings like libraries, town centres, community centres; or part of private buildings like shops, factories or telecentres. In constructing such “buildings,” issues such as noise, connected and unconnected spaces, electricity and telecommunications, and public and private learning spaces need to be considered.

COMMUNITIES AND THE INTERNET

As the Internet is becoming a major influence in education, trainers feel the impact on their lives and the lives of their students. How can we help students avoid a sense of alienation as they work with computers? First came television and video games-now more hours are spent in isolation "surfing the net". In the future, many courses will be computer-mediated. Work may be generated from the home computer. Is it possible we will see each other primarily on monitor screens?

The Antidote? Through this vast network we may in fact, become more connected, more unified. Communities now benefit from this system of communication, from meeting electronically. The following sites promote connections. This collection demonstrates the variety of "communities" now active on the Internet.

The ever increasing presence of Community networks in the medium facilitates learning within the virtual community and, furthermore, enables the accumulation of power in the hands of independent groups of people, thus enabling participation of marginalised groups and individuals. Perhaps, this is the answer to Henrick van der Zee's (1991) call for organised counterforces who will eventually build a learning society.

Education and Community—Four Scenarios for the Future of Public Education: Global Business Network and the National Education Association (USA) came together to create scenarios on the future of public education. Trends that cut across all scenarios are: the decline of the nuclear family, the issues surrounding special education, and the promise of technology.

Scenario 1: Orthodoxy. Hierarchical (traditional), Inclusive: "this scenario assumes a turn towards traditional values, and the effort to enlist educators to impose those values on any and all who might resist them."

Scenario 2: Orthodoxies. Hierarchical (traditional), Exclusive: "like the last scenario, this one, too, plays out the reaction against value-free public education. Today's public education would seem to avoid imposing any one set of values in order to avoid offending other sets of values. The last scenario accepts the risks of offending marginal groups by imposing one set of red, white, and blue values. Here, values are also central to education, but different values guide different schools."

Scenario 3: Wired for Learning. Participatory (radical), Exclusive: "this scenario revolves around new applications of information technology. Information technology influences all of the scenarios, but this scenario is distinguished by an evolution of information technology more rapid and far-reaching than most people now anticipate. That info-tech will influence education is predetermined. How, and how fast, is uncertain. This scenario assumes that the evolution is very fast, and that information technology is the biggest story in the transformation of education over the next decade."

Scenario 4: The Learning Society. Participatory (radical), Exclusive: "in this scenario the pieces come together. Technology moves faster than in the first

two scenarios, making this a radical change scenario. But the technology serves the ideals of inclusive community by facilitating a more participatory process than in the last scenario. Technology is a tool, not a driver. It serves the interests of play as well as work. Technology is designed to enhance humanity rather than to make money. The marketplace is less central than public space. While every bit as ubiquitous as in Wired for Learning, technology fades into the background of the Learning Society. It is a servant, not hero." (GBN, 1995)

Global Village or Global Imperium?: Ziauddin Sardar, visiting Professor of Science Policy at Middlesex University, is one of the few prominent voices to strongly question the "propaganda" about cyberspace. He challenges the view that the Internet is a tool which brings freedom and empowerment. He strongly feels cyberspace's gain is humanity's loss. Sardar, who hails from Pakistan, is an internationally-known scholar, information scientist and futurist. He has worked for British science journals like "Nature" and "New Scientist", and was Consulting Editor of "Inquiry". The book he coedited, "Cyberfutures: Culture and Politics on the Information Superhighway", had just been released by Pluto Press.

From basic literacy and numeracy education to the pursuit of advanced college degrees, computer technology appears to hold the promise of providing educational opportunities for all those who previously have been prevented from participating in adult education by the constraints of place or time. Yet, despite the resources devoted by governments across the world to adapting computer technology for purposes of mass adult instruction, policy development in this area has not resolved contentious issues of access and equity. Existing divisions between educationally advantaged and disadvantaged groups within societies, and between the first and third worlds, are likely to be gravely exacerbated as technology advances. Children who are borne into homes where computer terminals are as familiar as TVs or telephones have an inbuilt advantage when competing as adolescents for entry to an increasingly computerised higher education system, or as adults for jobs along the information super highway. This is a good example of how policy related to adult education and training must be coordinated with policy for children and adolescents at earlier stages in the life-span. Without the development of some universal computer literacy in schools-which itself requires children to have equal access to technological hardware and instruction irrespective of their class, ethnicity, gender or area of residence-there is a real danger of an informational underclass developing that parallels the economic underclass.

The future outcome will be largely determined by the expectations of those, in the population affected, whose aggregated individual decisions will shape that outcome. The confusion and uncertainty, caused by so many revolutions coming along at the same time-from the 'IT Revolution' though 'Postmodernism' to the 'End of Ideology', have resulted in a great deal of pain. In Thomas Kuhn's famous words—from the field of science—a paradigm shift is under way. His concept encapsulates much of what is now happening around us. According to

his observations, there is almost always a period of great uncertainty; as the defenders of the old world order, the old paradigm, dispute with those of the new.

TECHNOLOGICAL DETERMINISM AND THE NETWORK OF LEARNING SOCIETY

The Internet is an evolving, growing entity aligned to continuous technological change. This constant change is instrumental in paradigm shifts in the development of learning technology. To some learners (and educators alike) it appears to have become too complex, too technical, and many make an assumption of technological determinism. There is no need to assume technological determinism, we can ensure that the development of technology will not be detrimental to learning and education.

Barry Jones (1990) uses the example of Los Angeles and the way the car and tyre industry was allowed to replace the public transport system with cars and freeways, as a warning that we should not accept the consequences of technological determinism, but that we have a choice in the way technology is used and developed. The development of the car was an uncontrolled, chaotic phenomenon with wide reaching "side-effects", such as road deaths, urban sprawl and environmental pollution. This did not necessarily need to be the case, but was accepted as part of the development of technology.

The Alternative Network: In the educational field, as in the commercial, innovations may develop spontaneously. Some may be planned, such as in the commercial arena when a new calorie-controlled, portion-controlled, fixed weight chicken product is developed for sale to consumers at retail level because they are now cholesterol conscious and then diffuses to restaurants who in turn have expressed a need for such a product. Many developments have however occurred spontaneously from research with a different purpose, such as the many offshoots of the NASA space programmes and the Internet from its 1967 beginnings as ARPANET, initially commissioned by the US DoD and the Pentagon, for military purposes.

What is the Internet?: At a technological level, the Internet is millions of computers (no one is quite sure how many,) interconnected through the worldwide telecommunications systems. All these computers are able to share information with each other because they use common communications protocols.

At the human level, the Internet is the people who use those computers and the information they share. The people come from all walks of life, acting both as private individuals and representatives of organisations. Everyone on the Internet can publish information on any subject they wish, and almost everything published is available to everyone else. As a result, the content is staggeringly extensive and varied.

Finally, the Internet is a technological, social and cultural phenomenon, unlike anything the world has seen before. It has emerged as such not because of some ideology or social manifesto, but simply because of its anarchic technological

structure. It might be seen as historical irony the reason that this network was initially built during the period of the cold war, which was to ensure that there would always be some means of communication in case the USA was hit by enemy nuclear missiles.

Unlike other human-conceived networks which exist since the beginning of humanity (*e.g.*, power and energy networks), the Internet is not owned by anyone. No one owns the Internet. It is shared, by the consensus of its users. It does not come from a place, or even a country. It recognises no political boundaries. It was not invented. It evolved, over three decades, from the desire of people worldwide to share knowledge and to communicate.

- "Why do people want to be "on the Internet?" One of the main reasons is simple freedom. The Internet is a rare example of a true, modern, functional anarchy. There is no "Internet Inc." There are no official censors, no bosses, no board of directors, no stockholders. In principle, any node can speak as a peer to any other node, as long as it obeys the rules of the TCP/IP protocols, which are strictly technical, not social or political. (There has been some struggle over commercial use of the Internet, but that situation is changing as businesses supply their own links)." (Sterling, 1993)

Trends in Technological Change: Different technologies and methods for educational delivery. People retain about 20 per cent of what they see, 30 per cent of what they hear, 50 per cent of what they see and hear, and up to 80 per cent of what they see, hear, and do simultaneously; to the extent that computer-based learning systems integrate these techniques, they can be very effective.

Technological change, occurring at a faster rate now than ever before, is having incremental effects upon communication and social interaction. Increasing sophistication in the technologies of communication and computerisation are decreasing the cost and increasing the availability of instantaneous communication across the world. Electronic Mail, video-conferencing and multimedia applications are just a few examples of innovative technology now being used in education.

The use of the Internet is growing exponentially, although it is not possible to measure accurately that growth rate. These figures are collated by one of the largest Internet hosts in the USA, using world wide surveys. They show that minimal figures of Internet hosts had reached approximately 13 million by mid 1996 and exceeded the 20 million mark by August 1997, of which approximately 5 million were European hosts representing a quarterly increase of nearly 15 per cent.. Of these, educational institutions as hosts (edu domains) had reached more than 2 million by June 1996 and neared 3 million in August 1997.

One of the implications of this is that our learning institutions and practices will change. Moore (1995), refers to models explaining how educators will respond to new technologies:

- The minimal change model-in which instructors make no fundamental changes but merely use technology as an instructional aid;

- The marginal change model-in which the pedagogy and organisation of education remain unchanged and students are added on to conventionally taught classes (the most common application of distance education in North America);
- Systemic change in which institutions change the fundamental organisation of teaching by reorganising it into a system driven by technology; and a virtual system in which universities and schools are "place-free, with little or no formal organisation"

Only the last model acknowledges the existence of a paradigm shift. It differs significantly from Scott's notions of the British perspective (Scott, 1993), as it attempts to do away with the established institutional culture. This model should flow on to changes in the text-paper based emphasis on knowledge and content, and to the training of teachers, and perhaps a redefining of the position of teacher from "teacher as knowledge source" to "teacher as facilitator of the learning process" (D. Spender, 1995, pp114ff).

Other implications of this are that there will be fewer on-campus students, more education over the Internet, more universities online, and "virtual degrees" through virtual universities. The methodology of education will change, becoming more varied and flexible. Isolated and other marginalised students will benefit-assuming they have the technology of access. An example of this trend is Ken Eustace of Charles Sturt University, Australia, who has received accreditation for an MA from Paideia University. Eustace is the first Australian academic to be awarded an online degree from a "Virtual University".

"The electronic transfer of a global Master's degree over the Internet from Paideia University in Amsterdam to Perth in Australia six weeks ago signified the start of profound changes-and dilemmas-to the university system", The 'Australian' reported on 6th September 1995. There is a wide spectrum of learning opportunities on and over the Internet, especially on the World Wide Web. The existence of Virtual Universities and Classrooms on the Net paves the way for wider access and participation for adult learners as it changes the philosophy and practice of ODL.

Hypertext, the nonlinear medium, a term coined by computer utopian Theodor Nelson in his 1974 'Computer Lib/Dream Machines' to describe electronic texts embedded with links to other texts is yet another tech-tool which enhances learning, breaks down the traditional linear narrative of the written word by encouraging readers/users/surfers to find their own paths though large amounts of information. His idea came to fruition with the advent of the World Wide Web, where "hypermedia" also includes sounds, pictures, and moving images. Hypertext was the first tool to enhance interactivity on the Net.

The capacity for learners to add to the dialogue through an interactive medium provides opportunity for development, application and linkage of new knowledge to the adults own learning context. The Internet recreates the 'agora' or meeting place in which knowledge is not only shared but created and recreated. Learners

engage in active learning within conferenced environments where they take responsibility for their own learning processes. Learners "are required to examine thinking and learning processes; collect, record, and analyse data; formulate and test hypothesis; reflect on previous understandings; and construct their own meaning" (Crotty 1994, as quoted in Jonassen et al., 1995, p. 11) within an environment that gives the opportunity for students to interact together to build a community of learners.

Computer conferencing (CC), now common on the Internet, is a technology that facilitates interaction between learner and instructor and among learners and, potentially, opens the door to active learning. It creates opportunities for students to engage in the kind of active learning activities that Meyers and Jones (1993) and others identify. For example, CC allows the formation of small groups, creates opportunities for collaborative learning, discussion using case studies, role playing, simulations, online journaling, and provides opportunities to discuss and make connections between content and their own lived experiences. One such example could be the online experience I have had in attending one of the newly established OU courses which are delivered over the Internet.

A Case Study within the Project: Because of its asynchronous nature, CC-based group discussion allows for more thoughtful, well-constructed responses than one might find in a face-to-face classroom. Also, within the group context, students have opportunity to interpret and transform content (*i.e.*, make content their own); they can integrate new material with what they already know about the subject. Both large and small group discussion facilitates the active exchange of ideas and opinions related to specific content.

MZX205 is a computing OU course. It is delivered in the usual OU manner, plus the fact that OU offers learners access to its WWW and e-mail conferencing facilities over the Internet. Since the beginning of the term, I have accumulated 362 conferencing messages from the 21 fellow learners on the course. We have been discussing our common concerns on the course, facilitating each other and commenting on our work, flaming about and complaining, socialising in virtual reality, using our first names and showing intimacy rarely found in everyday acquaintance under similar circumstances.

CC mediated case studies and collaborative activities gave us opportunity to apply and test theory and knowledge to a "real-life" context. Specifically, collaborative activities encouraged mutual decision-making, and shared analysis amongst group members (skills that are valuable in the work world!). Generally, we were required to produce some product as evidence of our collaborative efforts, such as a final report or posting which was presented online for comments from other students and the instructor. Online journaling allows learners to reflect on content in a personal context, and to analyse and evaluate content in light of their experience. This reflection facilitates a personal level of integration and interpretation of content. Although an individual activity, journaling is, nonetheless, "active," because it provides the opportunity for reflection on and "meaning-making" with regard to course content. (SCHANK, R. & CLEARY, C.1994).

TEACHING AND LEARNING CHALLENGES

STRUCTURING AN ONLINE COURSE

- Course Planning
- Course Organization
- Communication.

Experienced online instructors and students alike emphasize the need to have a clearly structured and well-planned course when teaching and learning online. Structuring the course effectively means planning the course well in advance of when it is being taught, thinking through the organizational structures and qualities that will help students learn, and understanding that the online environment presents a number of communication challenges.

Course Planning

Designing a course always takes a great deal of time and thought. That is no different with online courses. At the same time, the online environment offers particular obstacles and opportunities for both instructors and students. As you think through the course elements, pay particular attention to the course components that may serve as stumbling blocks to student learning online. One particular tension that emerges is the need to have a clear and organized structure, while allowing flexibility for making adaptations mid-stream.

- *Develop your course before the semester begins:* Often new faculty discover that developing online courses is time-consuming and that transitioning a successful traditional course to an online setting can be difficult. Experienced online instructors suggest developing your course well in advance and with a clear, concise objectives statement. The better prepared you are, the better your online teaching experience will be.
- *Allow flexibility in your course design:* Although it is important to make course expectations and due dates clear, it is also important to build in flexibility to your schedule. Building flexibility into your course structure will allow you to compensate for unexpected technological problems as well as give you opportunities to respond to student feedback.

Communication

In considering how you communicate with students about course goals and your expectations, it is again important to remember that students experience your course on their own and will come to the course with varying levels of technical expertise. Place important information in a variety of places, and repeat it often, in order to enhance the chances that students will pay attention to it.

- *Give students a clear overall understanding of the course structure*: Students need a clear message of the "vision" of the course so provide them a sense of the overall landscape of the course.
  - *Tip*: Use a Table of Contents layout design to help first time online students understand the structure of the course. The Table of Contents style is similar to printed material. The sample course homepage in this stage for an example of how to provide a sense of the overall landscape of a course.
- *Post course syllabus, policies, expectations, and objectives on the course website*: You will most likely not be available to respond immediately when students e-mail questions regarding assignments or due dates, so posting your syllabus on the course homepage will eliminate confusion.
  - *Tip*: Students will access the course homepage at any time of the day or night. You can't always be online to answer questions, so make the assignments easy to find and easy to understand.
- *Setup a housekeeping clearinghouse part on your webpage*: To cut down on the number of individual questions, set-up a housekeeping clearinghouse part on your webpage where students can post a question and get answers about general course information. Encourage students to go to this part of the course before asking the instructor.
- *Use printed materials if a student requests*: Have a printed workbook of course syllabus and other critical course information available for students who request printed copies.
  - *Tip*: For engineering courses with heavy math content, provide detailed lecture notes, solutions, and other course materials in PDF format before the lecture date or online access date. This will allow students to download and print course material in advance.
- *Structure online discussions*: Structure the course to capitalize on the threaded discussion format. Use existing textbook material or website readings for "lecture" and guide students through activities and threaded postings for active learning.
- *Remind students frequently of due dates*: Use a technique like "Nag Notes" to remind students of due dates and other requirements.
  - *Tip*: One Communication professor uses "nag notes" to remind his students of due dates. For example:
    a. I've posted the topics proposed thus far. Browse to projects/ paper No. 1. Reminders:

b. For Wednesday, Read the Birkerts piece, "Into the Electronic Millennium."
c. For Monday, Read Postman's and do the IT/HC in the News Discussion Forum assignment.

Creating Community

- Student-to-Student Interaction
- Faculty-to-Student Interaction
- Tone

In an environment where instructors do not necessarily meet students face-to-face and where students may never have an opportunity to meet their peers in a physical classroom, developing a sense of community can be particularly challenging. At the same time, a sense of a community–where students are able to work cooperatively with peers on course material, have the opportunity for positive interaction with the instructor, and where the learning environment is respectful and motivates students to do their best–is key to a positive and successful learning experience. This part provides a number of solutions for creating community in the online classroom. The Online Fellows are quick to point out, however, that creating community is a challenge, and classroom dynamics must be monitored throughout the semester to ensure that students continue to engage thoughtfully in course content and continue to work together productively.

Student-to-Student Interaction

As the Principles of Good Practice in Undergraduate Education make clear, student learning in any classroom is enhanced when students have the opportunity to connect with each other about their academic work. For the online instructor, facilitating student-to-student interaction is made particularly challenging because students do not naturally have a chance to get to know each other before class or in face-to-face conversations. Therefore, it is important to structure opportunities where students "have" to interact with each other. It is also important, however, that the instructor develop methods for monitoring the success of these interactions. The Online Fellows offer the following recommendations:

- *Limit the size of discussion groups*: Rather than having an entire class talk in one large group, break the class into smaller discussion groups of four or five students. That way, students can get to know each other in a more intimate way.
- *Allow students to post student-to-student communication to get answers to questions*: Encourage students to discuss among themselves. Do not respond to every comment-interject and guide the discussion. Encourage students to introduce themselves to the group at the beginning of the semester.

- *Pair each student with a"buddy" in the course*: The buddy system gives students a source of support in the online classroom. Some instructors match students with varying technological experience. Other instructors prefer to match students who possess similar technological skills. Pair students according to the goals of your course or the assignment.
- *Encourage peer response*: Post student papers online and ask each student to select a partner to critique each other's work. Be sure that students know their paper will be posted.
- *Structure opportunities for personal interaction*: Incorporate opportunities for students to tell you something about themselves in a"student lounge" or meeting place. A"student lounge" can also be a place where students can share with each other, meet each other virtually, and learn more about each other without your presence. The"Student Conference Centre" at the end of this stage for an example of how to set up such a location on your course website.

Faculty-to-student Interaction

The Principles of Good Practice highlight the importance of faculty-student interaction in promoting learning. The online environment is not necessarily conducive to this goal, because neither the instructor nor the student can rely on regular face-to-face interactions to reinforce one's willingness to be helpful and approachable.

Experienced online instructors, however, have identified the following ways to help enhance faculty-student interactions:

- *In your written communication, present yourself as accessible to students*: Students in an online course must feel that you are approachable. Often the demands on teachers are greater in online courses, so it is important to explore the variety of ways you can send a message of availability. One way to bridge the distance between faculty and student is to address students by name. Praise student-initiated contact.
  - *Tip*: To make yourself seem approachable to students, try using a more informal tone. For example, "Today, as you all are well aware, our class officially begins. Please begin working on the assignments for July 15-21. You have a couple of assignments due tonight"
- *Schedule an in-person meeting of the entire class*: If possible, meet with students in person for one session at the beginning of the

semester. Meeting in person helps students associate names with faces and can be an effective, timely way to accomplish many of the administrative tasks central to your course.

- *Generate frequent communication*: Students need to have a sense the instructor is really "there," not "missing in action." This means responding in a timely manner to individual questions or issues that are raised in discussion groups. It also means making your presence known by participating in online discussions, giving students regular feedback on their work and their comments, and being flexible enough to make changes to the course mid-stream based on student feedback.
- *Assign discussion group leaders or project team leaders to facilitate group work*: Assigning team leaders is one way to ensure that students receive ample feedback. Make sure that the team leader disseminates information to every member of the team. Part of the responsibility of the team leader should be to report to you frequently on the progress of the team.

Tone

Remember that in the virtual classroom, neither the instructor nor the student has the visual cues of face-to-face communication. This also means students have fewer methods for determining whether their efforts are comparable to those of their peers and for assessing how they are doing in the class. Students will use the cues that are available to help them understand the classroom climate. Therefore, how the instructor shapes the course climate through written comments and the tone of communications to students is particularly important.

- *"Humanize" the course*: Remember that although you are teaching online, you are still teaching real people, so it helps if you and students can put names with faces. Develop a portion of the course website to post pictures and brief bios of students.
- *Avoid general broadcast questions*: An online course is not a collective but many individuals all reading messages separately. So, a broadcast message like "Are you doing the reading?" is hard for a student sitting at his/her own computer to interpret.
- *Consider the tone of your own responses to students*: Attitude comes through in writing. Are you sounding impatient? Supportive? Praise and model appropriate tone.
- *Use private e-mail for sensitive communications*: Use threaded discussions for group conversations. Use private e-mails to comment on individual student contributions and criticism.

LEARNING TECHNOLOGY

Learning technology encompasses a diverse array of tools, platforms, and methodologies designed to enhance the teaching and learning experience. From traditional tools like textbooks and chalkboards to cutting-edge digital innovations such as virtual reality simulations and artificial intelligence-driven adaptive learning systems, the landscape of learning technology is continually evolving. These technologies offer educators unprecedented opportunities to engage learners, personalize instruction, and facilitate active, experiential learning. By leveraging multimedia resources, interactive platforms, and collaborative tools, educators can create dynamic learning environments that cater to diverse learning styles and preferences. Furthermore, learning technology enables access to educational resources and opportunities beyond the confines of traditional classrooms, fostering lifelong learning and promoting educational equity. However, effective integration of learning technology requires careful consideration of pedagogical goals, technological capabilities, and ethical considerations. Educators must critically evaluate the potential benefits and drawbacks of different technologies, ensure equitable access for all learners, and provide ongoing support and professional development to maximize the impact of learning technology on educational outcomes. Ultimately, learning technology holds the promise of transforming education by empowering learners, expanding educational opportunities, and fostering innovation in teaching and learning practices. Exploring the transformative potential of learning technology, this book navigates the evolving landscape of educational innovation and its impact on teaching and learning.

Dr. Rajender Kumar Godara is associated with academics for more than 25 years. He holds the degree of M.A. from M.D.S. University, Ajmer, B.Ed. from Punjab University, Chandigarh, and M.Ed. from M.D.S. University, Ajmer and Doctor of Philosophy in Education from Rajasthan University, Jaipur (Rajasthan). He is supervising research work in the field of Education. At present he is working as Dean, Faculty of Education, Tantia University, Sri Ganganagar (Rajasthan). He has been continuously involved in research work with a bulk of publication in renowned journals and attended various conferences and seminars and workshops to share and impart his knowledge and view. He has a vast experience of being a member of numerous committees at University Level. 22 Ph.D. Research Scholars have been awarded Ph.D. degree under his supervision. He has participated and presented papers in more than fifty (50) International/National Seminars and already eight (08) books are published by him.

ACADEMIC
UNIVERSITY PRESS

4378/4-B, Murarilal Street, Ansari Road, Daryaganj, New Delhi-110002
Phone : +91-11-23281685, 41043100, Fax: +91-11-23270680
E-Mail: academicuniversitypress@gmail.com

ISBN-978-93-6284-763-8