



MDE-418

Educational Communication Technologies

Block

4

INTERACTIVE DELIVERY METHODS

UNIT 16

Email, Mailing Lists, Discussion Groups, RSS Feed	7
--	----------

UNIT 17

Web 2.0	25
----------------	-----------

UNIT 18

Virtual Classroom and Virtual Reality	45
--	-----------

UNIT 19

Reusable Learning Objects	67
----------------------------------	-----------

UNIT 20

Learning Management Systems	95
------------------------------------	-----------

MDE-418: Educational Communication Technologies

(New Course in place of ES-318: Communication Technologies for Distance Education)

EXPERT COMMITTEE

Prof. A. Sukumaran Nair (*Chairman*)
Former Vice Chancellor
Mahatma Gandhi University
Kottayam

Prof. O.S. Dewal
Former Founding Director
National Open School, New Delhi

Prof. K. Sudha Rao
National University of Educational
Planning and Administration,
New Delhi

Prof. Chandra Bhusan
Formerly CIET, National Council for
Educational Research and Training
New Delhi

Prof. Santosh Panda (*Convener*)
Director
Staff Training and Research Institute of
Distance Education
IGNOU, New Delhi

Prof. K. Murugan
Director, School of Humanities
Tamil Nadu State Open University
Chennai

Prof. S.V.S. Chaudhary
School of Education
IGNOU, New Delhi

STRIDE Faculty

Prof. P.R. Ramanujam

Prof. C.R.K. Murthy

Prof. Madhu Parhar

Prof. Basanti Pradhan

Prof. P.K. Biswas

Dr. Sanjaya Mishra

Dr. Ashok K. Gaba (Now with SOVET, IGNOU)

Ms. Mythili G.

Mr. Tata Ramakrishna

Dr. Rose Nembiakkim

Dr. Satya Sundar Sethy (on lien)

COURSE TEAM

Course Contributors

Dr. Sanjaya Mishra (Unit 16)
STRIDE, IGNOU, New Delhi

Dr. Ramesh C. Sharma (Unit 17)
University of Guyana
Georgetown, Guyana

Prof. Uma Kanjilal (Unit 18)
SOSS, IGNOU, New Delhi

Dr. M.U. Paily (Unit 19)
Regional Institute of Education
Bhopal

Dr. Manoj Killedar (Unit 20)
YCM Open University, Nashik

Course Coordination

Dr. Sanjaya Mishra
STRIDE
IGNOU, New Delhi

Content, Format, & Language Editor

Dr. Sanjaya Mishra
STRIDE, IGNOU, New Delhi

Note: Unit 16 based on the works of Sanjaya Mishra, Steve McCarty, Neil Harris and Maria Sandor published in STRIDE Handbook 8 (2009). Unit 17 includes the works of Stephen Downes, and Terry Anderson published in STRIDE Handbook 8 (2009). Unit 20 includes the work of Sanjaya Mishra on Learning Management System published in STRIDE Handbook 8 (2009). Unit 18 includes the work of Sanjaya Mishra on Virtual Worlds published in STRIDE Handbook 8 (2009).

PRINT PRODUCTION

Ms. Promila Soni
Section Officer (Publications)
STRIDE, IGNOU, New Delhi

Mr. Sunil Kumar
Section Officer (Publications)
MPDD, IGNOU, New Delhi

October, 2010

© Indira Gandhi National Open University, 2010

ISBN-978-81-266-4878-8

All rights reserved. No part of this work may be reproduced in any form, by mimeograph or any other means, without permission in writing from the Indira Gandhi National Open University.

Further information about the Indira Gandhi National Open University Courses may be obtained from the University office at Maidan Garhi, New Delhi - 110 068.

Published by **Prof. Basanti Pradhan**, Director, Staff Training and Research Institute of Distance Education (STRIDE), IGNOU, New Delhi on behalf of the Indira Gandhi National Open University, New Delhi.

Cover design by M/s. ADA Graphics, New Delhi

Laser Typeset at : Tessa Media & Computers, C-206, A.F.E.-II, Jamia Nagar, Okhla, New Delhi.

Printed at : Public Printing (Delhi) Service

MDE-418: Educational Communication Technologies

Course Outline

Block 1 : Communication Technology: Basics

- Unit 1 : Introduction to Communication Technology
- Unit 2 : Communication Networks
- Unit 3 : Pedagogical Designs for Communication Technology
- Unit 4 : Managing Technological Change
- Unit 5 : Student Assessment in Technology Enhanced Learning and Evaluation of Technology

Block 2 : Technology Primer

- Unit 6 : Radio and Audio
- Unit 7 : Television and Video
- Unit 8 : Satellite-based Education
- Unit 9 : E-Learning
- Unit 10 : M-Learning

Block 3 : Content Creation Tools

- Unit 11 : Communicating with Graphics
- Unit 12 : Digital Audio
- Unit 13 : Digital Video
- Unit 14 : Interactive Multimedia
- Unit 15 : Creating Materials for the Web

Block 4 : Interactive Delivery Methods

- Unit 16 : Email, Mailing Lists, Discussion Groups, RSS Feed
- Unit 17 : Web 2.0
- Unit 18 : Virtual Classroom and Virtual Reality
- Unit 19 : Reusable Learning Objects
- Unit 20 : Learning Management Systems

Block 5 : Learning Portfolio

INTRODUCTION TO THE COURSE

In the previous courses you have studied that distance education is primarily a technology mediated system of teaching and learning. Media (especially electronic media) plays a significant role in the delivery of educational opportunities to people who need education at their door-step, study at their own pace, time and place. Educator's trust with technology has been a story of evolution of the media itself. Starting from the use of blackboard and the printed textbook for mass education, educators have always experimented with the use of technologies to improve their teaching and learning at all levels. With the emergence of a variety of Computer and Communication Technologies, the process of adoption and adaptation of innovative technologies for the purposes of education and research has increased manifold. The use of technologies for teaching and learning has been broadly used as Educational Technology, which is the field concerned with the design, development, utilization, management, and evaluation of processes and resources for learning. The Association for Educational Communications and Technology (AECT) defined educational technology as "the study and ethical practice of facilitating learning and improving performance by creating, using, and managing appropriate technological processes and resources"¹. Historically the term educational technology has roots in audio-visual communication, systems approach, and educational technology as a process. In 1994, the AECT accepted 'educational technology' as synonymous with 'instructional technology'. We use the title of the course as Educational Communication Technologies to discuss the use of a variety of technologies for educational communication purpose. We would like you to have an overview of the field, and we are sure your engagements in the course would lead to your further exploration of the field through reading further literature given as references in the units throughout the course.

Course Objectives

At the end of the course, you are expected to be able to:

- Critically examine the process of educational communication to plan, design and use appropriate communication technologies in context;
- Identify the range of educational communication technologies, and their relative strengths and weaknesses;
- Use educational communication technologies confidently to create digital content and deliver these through new information technologies;
- Discuss and explain the general trends in the developments and use of educational communication technologies at national and international level; and
- Create engaging, collaborative, reflective and authentic learning environments for delivery of education and training.

Though the course is theoretical in nature, it has a lot of practical components, and we expect you to use this course to develop skills of using the technologies discussed in the course. We expect you to develop independent learning abilities to use computers and other technical hardware to create learning resources and environments that are interesting, motivating and engaging to the learners. So, you may need access to computer and Internet at home, office or in a cybercafé to practice the ideas and skill related inputs given in the course.

¹ Januszewski, Alan & Molenda, Michael (2008) *Educational technology: A definition with commentary*, New York: Lawrence Erlbaum Associates, p.1

We have also develop a short but interesting **Portfolio** that will give you instruction on how to practice the skill component, and record the outcomes. The portfolio shall be considered as the assignment component of the course and it would be evaluated at your study centre. You will submit the Portfolio at the study centre for evaluation after completing the activities mentioned there. You may like to discuss these activities in the counselling sessions with the available counsellor, who is trained to guide you to accomplish the tasks of the course. He/she will evaluate your engagements in the course through what you present in the portfolio.

There are **Check Your Progress** questions spread over in the course, and we expect you to do these before you actually check for the feedback given at the end of the units. These are opportunity for you to assess your own progress. These are places where you take pause in reading, and think, do, write, discuss and compare your answer with that of the one given at the end. If you check the response before you actually do the task, it would be cheating yourself, and we are sure you will not prefer to do so. If your response is different than the one given in the feedback, we advise you to re-check your own conceptions and thinking about the question/issue and read the topic again.

You may also like to highlight such areas for discussion in the **Counselling** sessions. Your interaction in the counselling session would make it more meaningful and lively. Counselling sessions are also the time when you can meet other learners, and see the diverse nature of the learner profile. It is encouraging to meet people with diverse background reading same subject and discussing and sharing ideas discussed in the course. If your learning style is more towards discussion and interaction, I suggest you must attend the counselling session. Even if, you are shy and like to study on your own through the materials supplied, counselling sessions provide you information about further readings and appraise you of the latest developments in the field. There is so much to learn form others, who are also seriously engaged in learning the same subject. Personally, I have benefited a lot by attending the counselling sessions, when I studied through distance mode.

Besides the counselling sessions, there are other media materials, and services available in this course, and you may like to take advantages of these by attending the teleconference session/virtual class as and when conducted. You will receive information about special arrangements regarding this from time to time.

What is covered in this Block?

You have progressed considerably having read the three blocks in this course. So far you have covered the basics of communication technology and media, including pedagogical and managerial issues; different types of media and technologies; and specific content creation tools for audio, video, and the web. The fourth block is about making education and learning more interactive. In this block we cover interactive delivery methods, especially on the Web. The web technology has grown big and advanced; it can provide real-time virtual events online and simulate classroom is a distributed environment. This has become a big advantage for the distance educators to think of situations to provide more interactions to the learners in both synchronous and asynchronous manner. In Unit 16 we discuss email, mailing lists, discussion groups, and Really Simple Syndication (RSS) features of the Internet and the Word Wide Web. The web has changed from

1st generation read only mode to the 2nd generation read-write mode making it a truly interactive medium that allows instantaneous user contribution on the net, thereby encouraging development of communities of practice. This is called Web 2.0, and we discuss this in unit 17. In unit 18, we discuss virtual reality including Second Life and synchronous conferencing tools as interactive delivery methods. While, the web provides all interactive features, the content generation and its management have also gone through tremendous changes. We discuss about content development as learning objects in Unit 19, and then go on to discuss Learning Management System (LMS) in the last unit of this course. We expect you to study these carefully and implement some of these technologies in your own courses and programmes. In the Portfolio of this course you will have opportunity to implement some of these ideas to have hands on experience.



UNIT 16 EMAIL, MAILING LISTS, DISCUSSION GROUPS, RSS FEED

Structure

- 16.0 Introduction
- 16.1 Learning Outcomes
- 16.2 Electronic Mail
 - 16.2.1 Educational Uses of Email
 - 16.2.2 Using Email
- 16.3 Mailing Lists
 - 16.3.1 Working of Mailing Lists
 - 16.3.2 Mailing Lists for Educational Purposes
 - 16.3.3 Examples of Mailing Lists for Online Education
 - 16.3.4 Recommendations to Set up a Mailing List
- 16.4 Discussion Groups
 - 16.4.1 Educational Uses of Discussion Groups
 - 16.4.2 Using Discussion Groups
- 16.5 RSS Feed
 - 16.5.1 RSS in Education
 - 16.5.2 Using RSS
- 16.6 Let Us Sum Up
- 16.7 Keywords
- 16.8 References and Further Readings
- 16.9 Feedback to Check Your Progress Questions

16.0 INTRODUCTION

The Internet and its World Wide Web (Web or WWW for short) have normally been static and non-interactive communication technologies. However, in this block we are going to discuss about interactive delivery methods on the web. In this unit, you will learn about the features of email, mailing lists, discussion forum and RSS feeds as interactive tools in teaching and learning. Interaction between teacher and student and student and student have been touted as the most important aspects of teaching and learning, and especially distance education has been criticized due to absence of or poor interaction features. However, with the introduction of more and more interactive elements on the web, distance education can provide high quality interaction of all the three types identified by Moore (1994): Learner-content, Learner-Learner, and Learner-Teacher. In Unit 15, you have already studied about the web and how to create pages. You may like to re-call and review unit 15 before working on this unit.

16.1 LEARNING OUTCOMES

After working through this unit, you are expected to be able to:

- *Identify* content delivery tools on the web;
- *Describe* advantages and limitations of different methods and tools;
- *Discuss* models of teaching and learning using these tools; and
- *Use* these tools for teaching and learning.

16.2 ELECTRONIC MAIL

Electronic mail or in short “email” is one of the most popular and useful features of the Internet. By definition, it is mail delivered through electronic means. However, while tracing the development of email communication Tao and Reinking (1996) identified at least three definitions of email:

- 1) It is mail being transmitted electronically. This definition embraces fax and telex.
- 2) It is only communication through computers but would include graphics as well as texts as appropriate email communication.
- 3) It is only text being transmitted through computers between senders and receivers.

Today, email is primarily known as communication from one person to another or many others through the use of computer and networks.

Email addresses have standard three part format: userid@host.domain. The userid is the name identifying the user; @ [at] sign follow account name; and the host of the email account (such as Hotmail, Yahoo or any other webserver), and the domain (such as .in, .org, .com, .net, etc.). Some important characteristics of email are as follows:

- It is text-based, and requires literacy skills. Language is the major means by which the email communication is done.
- A mail once typed can be sent to multiple persons/locations without duplicating efforts.
- It is asynchronous in nature, and can overcome problems posed by geographical time zones.
- Messages sent and received as email can be stored and organized in a way that can facilitate easy retrieval.
- It is a cost and time saving technology. It also reduces the use of paper (environmental friendly).

16.2.1 Educational Use of Email

It is the use of email that makes e-Learning possible. In most e-Learning programme the basic need is to have an email account. Sometimes, a whole course is offered through email as well. So, the use of email is enormous in education. Primarily, email has two main applications in education: in research and in teaching. Email is used as a research tool, and also as a carrier of research tools (such as questionnaire and interview schedule). However, in the instructional settings email is used for communication and interaction between student and students, and student and teachers. Email provides the advantage of speed, and information and announcements about a schedule/reschedule of classes can reach the learners before they travel to the classroom/study centre. Learners with special needs (hearing impaired) can interact with the teachers using email, while visually impaired students can use email with other text-to-speech readers. In a conventional classroom, a student may feel intimidated to talk and raise questions/doubts, but can choose to interact through email. Email can be used for delivering of lessons, and teachers can develop email groups to discuss topics related to the curriculum (Dorman, 1998). Kramaski (2002) reported that email conversation was useful in construction and interpretation of graphs using EXCEL, and it enriched mathematical discourse. Kim (2008) through a

review of literature identified the following **advantages** of email use that contributes to academic achievement:

- Enabling immediate, frequent support for individual needs; learner-centred context; individualized instruction; exchange of resources and information.
- Fostering psychological comfort; intimacy; expression of personal ideas; opinions, and emotions; informal conversations; social content exchanges; interpersonal contexts.
- Building interpersonal skills, collegiality; awareness of others' attitude; insights into others' perspectives; close relationships.
- Developing thoughtfulness; cognitive task structuring; careful analysis; critical thinking; reflection; planning.
- Encouraging interest; enthusiasm; motivation; self-esteem; self-confidence; change in personal values; active participation.
- Permitting authentic but convenient context; gap reduction between knowledge and practice; real-world anxiety decrease.

16.2.2 Using Email

While it is almost redundant here to talk of the technology of email, as it is almost pervasive in higher education institutions. Nevertheless, you need to have an email account to teach and your students should have email accounts to take advantage of this technology. Either you can use the *free web-based email services* (that provide abundant space these days) or you can have a *client-based email system* in your institution that may use mail delivery software like the Eudora, Outlook, and others. However, it is most important to consider the *pedagogic issues* related to use of email in teaching-learning. In this context, we proffer the following guidelines:

- Analyze the individual and group needs, specially in the context of cognitive and no-cognitive support.
- Consider the skill level of your target group, and their familiarity with the use of email. Provide a short hands-on training and/or distribute a short printed guide for ready reference.
- Indicate email response time from the perspective of both the student and the teacher in the beginning of the course.
- Plan and develop templates for routine kinds of queries for use during the teaching process.
- Consider a theoretical foundation for your teaching approach by using various models available. Once such model that could be effectively uses is Keller's ARCS model. Attention enhancing mail can be sent in the beginning of the course, and when required to stimulate a sense of inquiry and curiosity in the student. Message that relate the content of the study to the learners present/future needs can be categorized as relevance enhancing message. Confidence-enhanced messages are utilized to convince the learners that after carefully reading and undertaking the tasks, they would be able to achieve their goals. Satisfaction related mails provide information on what the students would get after accepting and using the strategies given to them. So, while, using mail to provide instructions, you need to consider the purpose and use appropriate language to that effect.
- It is also important to be precise, without being too lengthy. You may avoid non-relevant message to the learners. But, you should check regularly about learner's progress through mail/phone.

- Reply to students' mail as quick as possible, but should not be delayed more than the promised time in the beginning of the course.
- Provide working weblinks in your mail.
- While using email as a discussion forum amongst the students on a specific topic, summarize the discussion every day/week/month. You may assign this task to specific student volunteers during the course. Consider giving weight to their involvement in such discussion in the final grade/credits.
- Ask students to submit assignments on due date; give sufficient alerts before the due date. Let them know the consequence of non-submission of assignments on time.
- Consider personal emails received from students as private, and do not share these with the group unless otherwise stated by the writer.
- Reply to emails carefully, and not in haste. Do a spell check before pushing the send button.
- Never promote spam/junk mail or chain mail forwarding amongst students/teachers.
- Ask students to use appropriate etiquette associated with the email. Use of capital letter in email is considered to be rude.

Check Your Progress 16.1

- Notes:** a) Write your answers in the space given below.
b) Compare your answers with those given at the end of this unit.

1) Write three characteristics of Email.

.....

.....

.....

.....

.....

2) Write in 100 words the advantages of email for educational purposes.

.....

.....

.....

.....

.....

.....

16.3 MAILING LISTS

So long as e-mail remains a major form of communication, mailing lists will provide a convenient means of message distribution. Mailing lists go by various names such as discussion lists or e-mail forums, which give a clearer idea of their nature or purpose. The providers of free mailing lists such as Google and Yahoo call them groups, which emphasize their role in maintaining topic-based communities.

A one of the earliest forms of ICT or communication through the Internet, mailing lists have also proven abidingly useful for educational purposes, including for information sharing and professional development among educators. Easy interfaces between e-mail and the Web have meant that the typical mailing list message links to a new entry on the vast WWW that is relevant to the list topic and expected to be of interest to list subscribers.

Mailing lists offer many flexible options depending on the needs of the user. Messages can be exchanged through e-mail client programs, through a Web interface, or most recently from hand-held devices such as mobile phones that have an Internet connection. The convenience of e-mail in most ways applies to lists as well, such as automatically forwarding messages. The ultimate convenience of e-mail or mailing lists lies in the fact that messages are *pushed* to the user automatically and effortlessly. Blogs and social networking sites purportedly superseding mailing lists have suffered from the drawback that the user must go to the Websites and *pull* the information from them. One may visit a Website only to find nothing new, which discourages one from returning to check again. RSS feeds have come along partly to fill this need of a preview of contents available (More on this later).

On the other hand, the very convenience and immediacy of e-mail tends to present the mailing list subscriber with information overload, although the unending problem of spam has seemed to affect mailing lists relatively little. The subscribers who can post to a list are under the control of a list owner with nearly absolute gatekeeping powers. Web archives can be set to be available to subscribers only or on the open Web and searchable. Subscribers for their part can set their subscription to a daily or other periodic digest of posts compiled in one message. They can set their subscription to no mail during busy periods, or just check the Web archives occasionally if they are available. Subscribers are free to either move from list to list according to their evolving interests or to stay in communities sustained by mailing lists.

16.3.1 Working of Mailing Lists

A listserv or list-serving program in a server computer automatically maintains a subscriber list and distribution options set by the list owner and each subscriber. An e-mail sent to the e-mail address of the list is generally distributed to each subscriber who opted for individual messages or is placed in a queue for digest subscribers. Web archives of all messages can be generated if desired, often with options of viewing posted messages chronologically, topically, or alphabetically by author.

Besides the owner there can be other list administrators to screen memberships or messages. A moderated list means first that the owner selects certain controls over how to subscribe, who can subscribe, and whether attached files are transmitted or not. For example, subscribers may have to fill out a Web form first to show legitimate intentions in terms of the purpose of the list. Moderation most often means controlling what content is allowed to be distributed, by blocking messages considered irrelevant or offensive. Moderation criteria should be clarified in the welcome message to new subscribers along with the mission of the list. Moderation is particularly important where all messages are archived on the Web and accessible to search engines. Messages with inappropriate content are best prevented before distribution, because in most cases the list owner cannot eliminate individual messages from the Web archives at the server computer level.

To moderate a list also means to mediate among subscribers and active posters to control the number, length or other aspects of messages, to mitigate unproductive quarrels by persuasion, or to maintain standards of conduct. In the case of academic mailing lists, the moderation could extend to maintaining scholarly rigor and collegiality. E-moderation has become a topic of importance in books and Websites because of the need for quality of communication in mailing lists serving a vast number of interests and disciplines. While the list owner has arbitrary powers and is generally safe from legal challenges, in order to satisfy list members that the process is fair, sometimes list owners have negotiated their policies democratically with subscriber input. However, a list is generally most successful when moderation is least needed or remains invisible in the background.

Distribution Lists

However, not all mailing lists are set to an each-to-all mode for the purpose of discussion. A one-way distribution list with a few-to-all setting can still serve a community with a common interest, but with the focus on propagating information. Rarely distributed more than once a day, they tend to be edited and concise to maximize the information that an individual may wish to receive. Major newspapers such as the *New York Times* and *Financial Times* offer free distribution lists with headlines and links to stories at their main Websites. Such distribution lists are also called mail magazines, and indeed the capabilities of e-mail messages through HTML markup, links, photos and other embedded media approach the appearance of Web pages. If there is a market for certain specialized information, such as investment advice that is perceived as economically valuable, people are sometimes willing to pay for distribution lists.

At the same time, to serve the various needs of a community for both discussion and straight information, an organization can maintain any number of discussion lists as well as distribution lists. There are few technical restraints except that a virtual organization can become scattered as members belong to different communication channels that do not intersect. That is why the topics of mailing lists need to strike a balance between being too general and too specific. Lists may need to serve specialized needs of individual members while remaining general enough to maintain an active community. Moreover, people's interests change along with current events and technological progress.

16.3.2 Mailing Lists for Educational Purposes

Educational mailing lists can and do run from the class level to the global level. A teacher, for example, may set up a mailing list with the campus e-mail addresses of all the students in order to reach students quickly about assignments, announcements, class changes or cancellations. In a one-way transmission mode from the teacher, the mailing list format is merely for convenience, whereas mailing lists lend themselves readily to each-to-all discussions. With sharing among peers and group self-regulation, the teacher can observe without intervening. Provided the mailing list is set to accept attachments, the list members can share multimedia files such as voice messages or videos.

A university or other educational institution often finds it useful to set up many mailing lists on the institutional listserv. They can serve as routine communication channels for departments or other divisions of the institution such as staff or administrators. Then finally there are the geographically or

topically based mailing lists that extend beyond institutions, sometimes global in scope or relevance. Academic mailing lists may evolve from generalized topics to more specialized topics over time. However, there are fields such as distance education where a wide geographical distribution continues to provide mutual benefits to subscribers.

16.3.3 Examples of Mailing Lists for Online Education

Online education is one of those fields that, while gradually becoming more specialized in world regions and academic disciplines, can still bring together a global membership in mailing lists or virtual organizations. There is a widespread notion that mailing lists go through a life cycle of *initial excitement*, *intense participation*, then *irritation* at the overload of messages, leading to bickering, *breakup* or apathy. But while the psychology of novelty and other aspects of human nature are involved, the life cycle could easily become a stereotype like believing that all travelers experience culture shock because certain stages are relatively common. Some mailing lists related to online education have been active since the 1990s, while subscribers cannot generally cope with dozens of messages a day, so the restraint of more considered messages is a welcome development.

The Distance Education Online Symposium DEOS-L is one example of a long-standing and active mailing list (the dash L in many mailing list addresses refers to Listserv, which is a registered trademark of L-Soft International) with subscription options and archives available for browsing at <http://lists.psu.edu/cgi-bin/wa?A0=deos-l&O=D>. DEOS-L is moderated and academically oriented, with a combination of general discussions on distance education and announcements for conferences and publications. Based in the U.S., it tends to be weighted toward North American perspectives because of the composition of subscribers, but it has also welcomed international threads in keeping with its topic and the reach of online technologies.

In the genre of free distribution lists, the OLDaily by Stephen Downes offers unconditional information about developments in online learning. Subscribers can receive a weekly digest or make comments at the Website <http://www.downes.ca/>. With no commitment necessary and little direct interaction, the community is entirely implicit but nonetheless sustained through the technologies and sources recommended as they resonate with subscribers' needs and interests.

Virtual organizations have relied upon mailing lists to keep members informed and interacting, so they may employ both discussion lists and distribution lists. Belonging to at least one of the lists is a minimum condition of membership in some virtual organizations to distinguish them from mere lists or Websites. The World Association for Online Education (WAOE) has been held together since 1998 mostly by mailing lists, moving between server bases in universities and free Web-based services such as Google Groups. However, belonging only to the WAOE general member discussion list has led some observers to believe that the list was the full extent of the organization. It was out of consideration for general members that organizational lists were separated from content lists focused on online education issues. Nevertheless, the discussion lists provide essential communication channels leading to deeper involvement in the organization along with opportunities for professional collaboration among the global membership.

16.3.4 Recommendations to Set up a Mailing List

Having reviewed some of the uses of mailing lists, for education and e-learning in particular, you should not hesitate to set up new lists where the purposes of discussion, information dissemination, or community-building may be served. Two widely-used, free, and easily managed Web-based mailing list services are Google Groups <<http://groups.google.com/>> and Yahoo Groups <<http://groups.yahoo.com/>>. Many of you may already have an account such as Web-based e-mail with one or both of the providers and may choose whichever seems more convenient. One generally signs up to be a list owner at one of the above Websites, or at the corresponding site in one's own country or preferred language. Then it is a matter of choosing among the available settings, such as how open the list is in terms of membership and Web archives, whether to moderate messages before release, then populating the list by generating direct invitation messages to e-mail addresses from within the group administration interface, or by publicly inviting people to visit the home page of the list.

Alternatively, mailing list software with Web archiving capability, some of which is free and open source software, can be set up on one's own institutional server. For more details see the Wikipedia entry on electronic mailing lists or e-lists: <http://en.wikipedia.org/wiki/Electronic_mailing_list>.

Even as successive technologies such as social networking or virtual worlds increasingly attract users to Web-based venues, mailing lists remain useful to reach people directly and unforgettably through their e-mail in-box. Mailing lists can complement other technologies where many choices are available, or serve as an essential communication channel in regions where online technology is most limited.

Check Your Progress 16.2

Notes: a) Write your answers in the space given below.

b) Compare your answers with those given at the end of this unit.

1) What is the difference between mailing list and distribution list?

.....

.....

.....

.....

2) Give two examples of mailing lists.

.....

.....

.....

.....

3) Give two situations for which mailing lists can be used.

.....

.....

.....

16.4 DISCUSSION GROUPS

Computer-mediated communication (CMC) is becoming more commonly utilized in the delivery of university curricula. There are different ways of incorporating CMC; one application that is being increasingly utilized is online discussion forum or group. As an application, the discussion group provides a limited and structured online environment for the provision, exchange and/or discussion of information between instructor and students and/or between students. A defining feature of the asynchronous discussion forum as an application is that it allows for comments to be posted and viewed at a time of convenience to the student or instructor, in other words, there is no need to be connected at a specific same time.

In order for e-educators and those utilizing a blended learning approach to achieve improved learning outcomes it is imperative that teaching and learning strategies incorporating online discussion forums are pedagogically sound. As such, the increase in usage of online discussion forums in higher education has led to the associated need to increase our understanding of how to best incorporate such applications into teaching (Stodel, Thompson, & MacDonald, 2006; Tallent-Runnels, Thomas & Lan et al., 2006).

16.4.1 Educational Uses of Discussion Groups

Within the e-learning environment, it is the discussion forum that commonly provides the means for considered dialogue between student and instructor as well as collaborative activities between students, without the requirement of a face-to-face encounter (Garrison, 1997; Kear & Heap, 2007). Rudimentary use of discussion forums within the delivery of a subject is as a means to provide information or direction to students on course content or administrative matters. Used in this way the forum offers the student right of reply often for confirmation of understanding and, perhaps more significantly, presents a lasting record of the information and ensuing dialogue for other students and instructors involved in the subject. This can contribute to a sense of a shared learning space and process involving instructors and students which can, in turn, lead to more open and productive communication around subject content and procedures.

A more advanced and increasingly used application of the discussion forum within education is as an online environment for subject content discussion, akin to a tutorial. A relatively straightforward approach to this is for the instructor to set a question or topic with students encouraged or required to respond to the content related topic and have on-going discussions with their peers on this topic (Johnson, 2006). This conception of the online discussion forum manifests in a question and answer format with the instructor posing the question, students required or invited to provide an answer and the instructor positioned to confirm, refute or provide the "right" or model response. Used in this way, the nature of asynchronous online discussion forums (messages and postings can be viewed when convenient for participants) offers students the time to reflect on the topic or discussion and thereby encourages a more in depth, academic and constructive dialogue (Sandor & Harris, 2008, Garrison, 1997; Johnson 2006). This is the real advantage of asynchronous discussion forums over more fancied synchronous applications such as real-time or synchronous audio, visual or even text only on-line classrooms or more informal and rapid dialogue applications such as blogs, wikis and chat rooms.

16.4.2 Using Discussion Groups

Teaching a course or even components of a course online is distinctly different from a face-to-face mode of delivery (Kelly, Ponton, & Rovai, 2007). Applications such as asynchronous online discussion forums permit greater flexibility for participants who can be studying almost anywhere at anytime (Dixson et al., 2006; Leh, 2002). From the instructor's perspective, this convenience for the student generates an onus upon the instructor to be regularly, if not near continuously, online to field questions, reply to postings and generally be an active leader of the dialogue within the discussion forums. Furthermore, to be absent or off-line for any significant length of time carries the risk of being viewed by course participants as unresponsive and uninterested which, in turn, leads to participants' reduced usage or withdrawal from online aspects of a course. Not surprisingly, many instructors perceive online discussion forums to be highly time demanding with limited reward or recognition for effort (O'Quinn & Corry, 2002; Rourke & Anderson, 2002; Spector, 2005).

Much of the usage of online discussion forums in higher education is didactic in nature positioning the instructor in a traditional educational role as the provider of knowledge (Light & Cox, 2001; Margolis, 2000). While this usage can have merit, there is a need to implement more innovative approaches to the medium of discussion forum that are pedagogically sound, engaging for participants and more time effective for instructors. In this regard, the distinctive asynchronous platform of the online discussion forum can be used to promote peer learning (Harris & Sandor, 2007; Kear & Heap, 2007). Given the widely acknowledged value of student to student interaction in promoting engagement with content and deepening learning, initiatives that draw students into online learning processes and encourage them to take a more central role in their learning are of interest (Boud & Lee, 2005; Kear, 2004).

Figure 16.1 presents a model of asynchronous discussion forums as a student-centred peer e-learning environment. This framework promotes greater student involvement and ownership by positioning the student as central in the learning process. The student is situated as the content expert and facilitator on a specific topic at the centre of the learning event, shifting the focus from the instructor to the student. The instructor has been repositioned as the overseer of dialogue; remaining abreast of the discussion should support and guidance be needed. The student becomes content expert by preparing and posting a primer or short essay (approximately 1 000 words) on a specific topic (e.g. Choose a health behaviour change model and discuss it's strengths and weaknesses in understanding and addressing a health issue of your choice) giving the student greater knowledge on the topic compared to his or her peers. All other members of the forum group provide academic comment on or build upon the primer that has been posted. As content expert, the student who posted the primer is also required to facilitate the discussion (three aspects of facilitation: content, leadership and processes) surrounding their particular topic thereby relieving the instructor of this role.

This framework has been developed and evaluated by Harris and Sandor (2009) over the last six years across a number of postgraduate and undergraduate courses delivered in both blended and online modes to combined cohorts of between 25-80 students who generally have limited experience of online discussion forums. In these courses the framework has been a central component and provided the basis for the majority of the

assessment. Discussion forums run weekly with students being assigned to write a primer on a set topic corresponding to course content. Students are then assessed on their primer, the facilitation and their postings in all discussion forums (70% of total assessment: 30% primer, 30% postings, 10% facilitation). To compress the discussion and keep the momentum within the dialogue, forums are only accessible for two weeks. Student feedback on the approach has been very supportive and highlighted the value of the approach for engagement with subject content and personal learning.

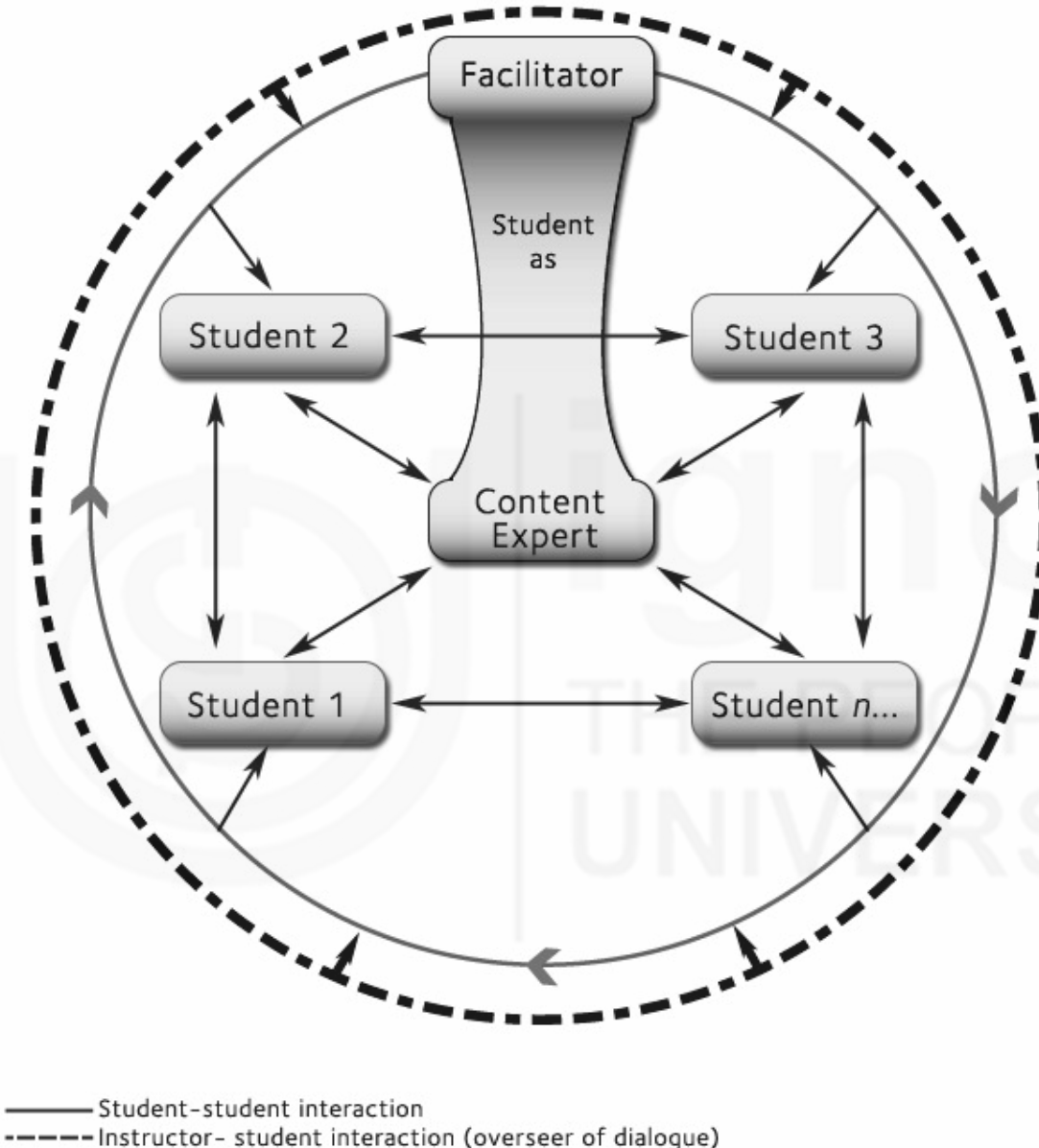


Figure 16.1: Online discussion forum as a student centred peer e-learning environment

With respect to applying the model of asynchronous discussion forums as a student centred peer e-learning environment there are a few key learning to be considered:

- *Assess forum participation:* A significant portion of the subject marks accorded to forum participation increases the student interest in participation. All three components - primer, postings and facilitation - should be separately assessed;

- *Participation as a requirement not an option:* Students are required to participate in each weekly forum with marks deducted for any forum missed by the student;
- *Limit the length of time the forum is open* (one to two weeks): This compresses the dialogue and promotes greater and more coherent interaction between students. If you are running a series of forums across the semester, this strategy will require students to engage with subject material on a weekly basis;
- *Limit participant numbers in a discussion group:* Too few and too many participants in a forum becomes counterproductive. Ideally between 10 and 25 participants in a group. Many less than 10 participants and there is not sufficient numbers to sustain a discussion, more than 25 and the forum becomes too busy with those who are less confident of their standing in the group fading out of the discussion; and
- *Set topics and assign students:* The forums must have an established set topic that is directly linked with the subject being studied - ideally supported with resources such as a lecture, topic notes, references, and web links. Students must be assigned to topics (primer and facilitation role) early in semester.

Check Your Progress 16.3

Notes: a) Write your answers in the space given below.

b) Compare your answers with those given at the end of this unit.

- 1) How does discussion group facilitate constructivist learning environment?

.....

.....

.....

.....

.....

- 2) How can you make effective use of discussion forum in e-learning?

.....

.....

.....

.....

.....

16.5 RSS FEED

RSS stands for Rich Site Summary or Real Simple Syndication. It is a type of XML document used to share news headlines and other web pages. Any web page with an RSS feed enables the user to track updates on that specific page in an automated manner through a single subscription, and without having to visit the page from time to time. "Because the data is in XML, and not a display language like HTML, RSS information can be flowed into a large number of devices. In addition to being used to create news summary web

pages, RSS can be fed into stand alone news browsers or headline readers, PDAs, cell phones, email ticklers and even voice updates" (Downes, 2002).

A single RSS file is called a channel. It consists of two major sets of elements:

- *Channel properties*: the name of the channel, the URL and an image for the channel; and
- *Item properties*: separate items listed in the channel with specific title and link.

Example:

```
<?xml version="1.0" encoding="utf-8"?>
<rss version="2.0">
  <channel>
    <title>Website Feed</title>
    <description>Website Feed coded manually</description>
    <link>http://www.yourdomain.com</link>
    <item>
      <title>Title of the item</title>
      <description>Description of the item</description>
      <link>Exact link for the item in your domain</link>
    </item>
  </channel>
</rss>
```

Where, this is coded as XML version 1, and RSS version 2, with the channel name Website Feed, and having one item.

The RSS file which is in XML can be created using a plain text editor (such as Word Pad or Note Pad). However, in practice you may not require to create an RSS file manually as most blogs, wikis and LMSs provide RSS feed as an automatic feature.

Typically RSS feeds would be used through a RSS Reader (like Google Reader or Bloglines) or an Aggregator (such as FeedReader or Yahoo Pipes). It could be desktop-based or web-based, but you need to subscribe to the RSS channels from varieties of sources into your Reader/Aggregator to receive updates without visiting the specific pages. Thus, it is like receiving only relevant news items from select sources and serve it at one place.

16.5.1 RSS in Education

In today's fast changing world, it is important to remain up-to-date without spending much time for relevant information on the web. Pre-identification and subscription to relevant XML files can save time and efforts of searching. While using collaborative social software like wikis, it is possible to get information about group contributions without visiting the wiki. You can subscribe to student blogs in a course to monitor their progress. One of the most important aspects of RSS is that while you use it, there is no need to supply your email, and thereby reduce the chance of spam in your inbox, as it usually happens with subscription to email newsletters. RSS can be used for a variety of purpose where it is important to be up-to-date. For instance, the Athabasca University's Centre for Distance Education used RSS feed in Blogger.com to provide required updates in the Centre's website (Mason and Rennie, 2008). Thus, the faculty members while maintained their own blogs, the programmers in the computer centre maintained the website by

subscribing to the RSS feeds of individual faculty. Thus, the faculty was no more dependent on the programmers and the programmers also had enough time to think about new design issues.

16.5.2 Using RSS

You can use RSS readers to remain up-to-date by becoming member of free services like Google Reader, Bloglines or Netvibes. If you have a Gmail, it is pretty easy to create a Goolge Reader account. Just go to <http://www.goolge.com/reader> and log in with your current Gmail userid and password. Once you log in, you will find the Google reader interface with left pan for subscription and the right pan for slowing the news items. In the left pan, you have link – Add a Subscription (see Figure 16.2). By clicking to that you will get a small field to type the RSS feed that you want to subscribe. For this, you need to identify the specific newsfeed. For example, the newsfeed for the blog – TeachKnowLogist is <http://teachknowlogist.blogspot.com/feeds/posts/default>. Once the same is typed/pasted in the field and click “Add”; you are subscribed to the feed, and start getting the updates as and when the blog gets a new entry!

It is also possible to embed a specific RSS feed into a web page. For this, you need to convert the RSS feed into Javascript (a simple facility is available at RSSxpress Lite on UKOLN) and embed in the web page.



Figure 16.2: Example of RSS Reader

Suggestions

- If you write a blog or engage in a collaborative wiki, you can use the RSS effectively to save your time and that of your students.
- You can encourage students to create their own Google Reader or Yahoo Pipes account on topics of interest to remain up-to-date.
- You can create news feed on select keywords through different search engines. For example, a search through Google News on “web 2.0” can provide a RSS feed such as <http://news.google.com/news?pz=1&ned=us&hl=en&q=web+2.0&output=rss> that can provide regular feeds to your RSS reader.
- You can subscribe to social bookmarking sites to know what other users are marking and tagging. For Example the RSS feed for the user ‘missan’ at Delicious is <http://feeds.delicious.com/v2/rss/missan?count=15>

Check Your Progress 16.4

Notes: a) Write your answer in the space given below.

b) Compare your answer with the one given at the end of this unit.

What are the advantages of RSS use in education?

.....

.....

.....

.....

.....

16.6 LET US SUM UP

In this unit you studied the educational usage of email, mailing list, discussion forum and RSS feeds on web pages. While we emphasized the importance of interaction, these technology tools provide easy way to teachers to create the interactive environment in online settings. We highlighted the advantages of email such as ease of technology, psychological comfort, building interpersonal skills, developing critical thinking and motivating the learners. We also provided a set of guidelines on how to use email for teaching-learning. Mailing lists as an extension of email that is group based was also discussed in this unit. While its use was discussed, two specific examples (such as DEOS-L and WAOE list) were also given as illustration. Furthering the use of technology for group learning, we introduced the discussion groups in this unit. We discussed online forums as an asynchronous tool that encourages dialogue, in-depth communication and constructivist learning. You also studied a framework for use of discussion forum in online and blended learning situation. In the next section, we discussed the use of Really Simple Syndication (RSS) that is Extensible Markup Language (XML) based to push information/updates to the learners. We also described the use of Google Reader to remain up-to-date in an interactive manner.

16.7 KEYWORDS

Email: is short form of electronic mail. It is mail delivered through electronic means.

Mailing lists: is a collection of names and addresses used by an individual or an organization to send material to multiple recipients through an electronic system such as *Listserv*.

RSS: commonly expanded as Really Simple Syndication is a family of web feed formats used to publish frequently updated works.

XML: is short form of Extensible Markup Language. It is a set of rules for encoding documents in machine-readable form.

16.8 REFERENCES AND FURTHER READINGS

Advantages and disadvantages in using email for teaching and learning, *Issues of Teaching and Learning*, 5 (3), Available at <http://www.catl.uwa.edu.au/publications/ITL/1999/3/advantages> (08/08/2009)

Bloglines: <http://www.bloglines.com/>

- Boud, D. & Lee, A. (2005). 'Peer learning' as pedagogic discourse for research education. *Studies in Higher Education*, 30(5), 501-516.
- Dixon, M., Kuhlhorst, M., & Reiff, A. (2006). Creating effective online discussions: optimal instructor and student roles. *Journal of Asynchronous Learning Networks*, 10(1), 3-5.
- Dorman, S.M. (1998). Using email to enhance instruction, *Journal of School Health*, 68 (6), 260-261.
- Downes, S. (2002). An Introduction to RSS for Educational Designers, Retrieved on August 8, 2009 from the Web at http://www.downes.ca/files/RSS_Educ.htm
FeedReader: <http://www.feedreader.com/>
- Garrison, D. R. (1997). Computer conferencing: the post-industrial age of distance education. *Open Learning: The Journal of Open and Distance Learning*, 12(2), 3-11.
- Glotzbach, R., Mohler, J. & Radwan, J. (2007). The Usefulness of RSS in Higher Education. In R. Carlsen et al. (Eds.), *Proceedings of Society for Information Technology and Teacher Education International Conference 2007* (pp. 3019-3026). Chesapeake, VA: AACE
Google Reader: <http://www.google.com/reader>
- Harris, N. & Sandor, M. (2007). Developing online discussion forums as student centred peer e-learning environments. In *ICT: Providing choices for learners and learning. Proceedings ascilite Singapore 2007*. <http://www.ascilite.org.au/conferences/singapore07/procs/harris.pdf>
- How email works? <http://www.learnthenet.com/english/animate/email.html> (07/08/2009).
- Johnson, G. M. (2006). Synchronous and asynchronous text-based CMC in educational contexts: a review of recent research. *TechTrends*, 50(4), 46-53.
- Kear, K. (2004). Peer learning using asynchronous discussion systems in distance education. *Open Learning*, 19(2), 151-164.
- Kear, K. L. & Heap, N. W. (2007). Sorting the wheat from the chaff: investigating overload in educational discussion systems. *Journal of Computer Assisted Learning*, 23(3), 235-247.
- Kelly, H. F., Ponton, M. K., & Rovai, A. P. (2007). A comparison of student evaluations of teaching between online and face-to-face courses. *Internet and Higher Education*, 10, 89-101.
- Kim, C. (2008). Using email to enable e³ (effective, efficient, and engaging) learning, *Distance Education*, 29 (2), 187-198.
- Kramarski, B. (2002). Enhancing mathematical discourse: The effects of e-mail conversation in learning graphing, *Education Media International*, 39 (1), 101-106.
- Leh, A. S. C. (2002). Action research on hybrid courses and their online communities [Electronic version]. *Education Media International*, 31-38.
- Light, G. & Cox, R. (2001). *Learning and teaching in higher education*. London: Paul Chapman Publishing.
- Margolis, M. (2000). Using the Internet for teaching and research: a political evaluation. In R. A. Cole (Ed.), *Issues in web-based pedagogy*. (pp. 9-22). Westport, CT: Greenwood Press.
- Mason, R., & Rennie, F. (2008). *E-Learning and Social Networking Handbook: Resources for Higher Education*, New York: Routledge.
- Moore, M.G. (1989). Three Types of Interaction, *American Journal of Distance Education*, 3 (2), 1-6.
- O'Quinn, L. & Corry, M. (2002). Factors that deter faculty from participating in distance education. *Online Journal of Distance Learning Administration*, 5(4), 1-16.
- Richardson, W. (2005). RSS: A Quick Start Guide for Educators, Retrieved on August 8, 2009 from the Web at <http://weblogg-ed.com/wp-content/uploads/2006/05/RSSFAQ4.pdf>
- Rourke, L. & Anderson, T. (2002). Using peer teams to lead online discussions. *Journal of Interactive Media in Education*, 1, 1-21.
- RSSxpress Lite: <http://rssxpress.ukoln.ac.uk/lite/include/?t=1>
- Sandor, M. & Harris, N. (2008). Understanding the experience of university students as facilitators of the learning process within the medium of online discussion forums. In I. Olney, G. Lefoe, J. Mantei, & J. Herrington (Eds.), *Supporting a Learning Community. Proceedings of the Second Emerging Technologies Conference 2008*, Wollongong: University of Wollongong, 173-181.

- Sherwood, K.D. (n.d.). A Beginner's guide to effective email. <http://www.webfoot.com/advice/email.top.php> (07/08/2009).
- Smith, C.D., Whiteley, H.E., & Smith, S. (1999). Using email for teaching, *Computers and Education*, 33 (1), 15-25.
- Spector, J. M. (2005). Time demands in online instruction. *Distance Education*, 26(1), 5-27.
- Stodel, E. J., Thompson, T. L., & MacDonald, C. J. (2006). Learners' perspectives on what is missing from online learning: Interpretations through the community of inquiry framework. *The International Review of Research in Open and Distance Learning*, 7(3), 1-24.
- Tallent-Runnels, M. K., Thomas, J. A., Lan, W. Y., Cooper, S., Ahern, T. C., Shaw, S. M., & Liu, X. (2006). Teaching courses online: a review of the research. *Review of Educational Research*, 76(1), 93-135.
- Tao, L. & Reinking, D. (1996). What research reveals about email in education, Paper presented at the Annual meeting of the College Reading Association, October 31- November 3, 1996. (ERIC Document No. ED 408 772).
- Why use email in your teaching? *Issues of Teaching and Learning*, 5 (3), Available at <http://www.catl.uwa.edu.au/publications/ITL/1999/3/email> (08/08/2009)
- Yahoo Pipes: <http://pipes.yahoo.com/pipes/>

16.9 FEEDBACK TO CHECK YOUR PROGRESS QUESTIONS

Check Your Progress 16.1

- 1) Three characteristics of emails are:
 - i) Email is asynchronous in nature;
 - ii) Messages sent and received can be stored, organized and retrieved easily; and
 - iii) Messages types once can be sent to more than one user/recipient.
- 2) Email has a number of advantages for use in teaching and learning. It fosters psychological comfort, intimacy, expression of ideas and informal discussions. As such it helps in building interpersonal skills, collegiality and develops higher order thinking skills. Being instantly delivered to the end user, it motivates the learner and encourages active participation.

Check Your Progress 16.2

- 1) Mailing list is a group mail system that maintains a subscriber list to distribute message when one of the members post message to it. By sending email to a given email address of the group, it relays the same to all the members automatically. Mailing lists are operated using web-based systems like Yahoogroups, and GoogleGroups or specialized software like Listserv. Listproc, etc. Mailing lists maintain threads on the web for record as well. It is a two way interactive system, whereas, distribution list are only one way, as it sends mails regularly to the subscribers with no mail reply function as in free magazines and newspapers.
- 2) To examples of Mailing List are: DEOS-L, and WAOE List
- 3) Mailing list can be used to broadcast programme related information and updates regularly to distance learners. It can also be used to provide interactions and training to the learners in small chunks and discuss issues of common interests.

Check Your Progress 16.3

- 1) Discussion groups can be used as a constructivist learning tool, where the learner can discuss a topic in an online group (with or without moderation), ask questions, answer questions asked by others, debate and construct meaning in context. Discussion groups are dialogic environment to foster constructive learning.

- 2) For effective use of discussion group in e-learning, the following can be considered:
- Student participation in discussion forum to be assessed
 - Participation should be a requirement to complete a course and not an option
 - Each discussion group should be available for one or two weeks
 - Involvement of student as moderators and leader to discuss topic
 - Topics for discussion given in advance

Check Your Progress 16.4

Using RSS in education helps the learner to save time. Students need not visit the institutional website for updates, as RSS feed of the page can reach directly the RSS reader of the learner. RSS can also help learners to remain up-to-date on specific topics of their interest.



UNIT 17 WEB 2.0

Structure

- 17.0 Introduction
- 17.1 Learning Outcomes
- 17.2 Web 2.0
 - 17.2.1 Comparison between Web 1.0 and Web 2.0
 - 17.2.2 Technology and Standards
 - 17.2.3 Big Ideas of Web 2.0
 - 17.2.4 Key Web 2.0 Services
- 17.3 Blogs
 - 17.3.1 Using Blogs in Education
 - 17.3.2 How to Use Blogging in Learning?
- 17.4 Wikis
 - 17.4.1 Strengths and Limitations
 - 17.4.2 Software for Wiki
- 17.5 Social Networking
 - 17.5.1 Challenges of Utilizing Social Networking in e-Learning
 - 17.5.2 Using Social Networking Effectively
- 17.6 Let Us Sum Up
- 17.7 Keywords
- 17.8 References and Further Readings
- 17.9 Feedback to Check Your Progress Questions

17.0 INTRODUCTION

In Block 2 you have learned about Satellite-based education, E-Learning and Mobile learning. Block 3 gave you detailed information on how to create materials for the web and what are various content creation tools with the help of which you can effectively deal with audio, video and interactive multimedia.

You will agree that the Internet and web technologies have changed the way the teachers used to teach and the students learn. Modern learner needs to be provided more educational opportunities for learning which are offered by modern technological revolution. The electronic delivery of instruction and ease of collaboration has enabled the teachers to use innovative ways to interact with students and other teachers. The modern Internet technology has not only influenced the teaching learning settings greatly, it has also influenced the personal and professional life of teachers. There are lot of new tools available now-a-days which the teachers and students can use: Blogs, Wiki, RSS feeds, video sharing, photo sharing, Chat, Electronic Portfolios (ePortfolios), Personal digital assistants (PDAs), Podcasts, 3D immersive environments, computer games, animation, and collaborative software. These software, systems and facilities on the Internet make teaching and learning interactive. The web, which was often used for static pages of information, now provides opportunity for the users to interact through dialog box, registration, etc. The new form of the web that has read-write abilities has been named Web 2.0. In this Unit we will discuss some of the Web 2.0 tools and their educational implications.

17.1 LEARNING OUTCOMES

After working through this unit, you are expected to be able to:

- *Identify* the Web 2.0 tools like blogs, wikis, and social networking;
- *List* the strengths and limitations of the various Web 2.0 tools; and
- *Use* Web 2.0 tools for teaching and learning.

17.2 WEB 2.0

The field of Computer Assisted Learning (CAL) has been transformed to a great extent, since the development of PLATO system in 1960. The traditional audio and video materials have been augmented by multimedia applications. The developments in the field of Web and digital multimedia have provided new opportunities to teachers to engage the learners as active learners. Emergence of Web 2.0 is the most phenomenal of them.

Traditionally the World Wide Web (WWW) has been considered as a place to retrieve information. The information provided through HTML codes and sharing of resources through FTP (File Transfer Protocol) was the main utility. But the drawback was that such flow of information was largely unidirectional. This necessitated the need for some interactivity on the web and tools were developed which would allow the users to add content to the web. Such content could be in the form of text, audio, video, slideshows etc. The communication became bidirectional. The term web 2.0 was first used in 1999 by Darcy DiNucci; but it came into prominence in 2004 when O'Reilly Media hosted the first Web 2.0 conference. Web 2.0 is the place where the users (teachers, students and anyone) could read and write. It has taken the educational delivery to the next level of advancement where content can be generated online through collaboration. It is an innovative platform where the creative minds meet and discuss or share ideas.

Before proceeding further, let's understand the difference between Web 1.0 and Web 2.0.

17.2.1 Comparison between Web 1.0 and Web 2.0

Web 2.0 is the second generation of World Wide Web which provides the facility of online collaboration and information sharing among people in a much active manner. While the web was intended to be two-way, most of the early websites were one way in the sense that you can read information from that. That made the early web as passive. The users were not able to contribute or interact or comment through its services.

Some of the differences between Web 1.0 and Web 2.0 are depicted in Table 17.1.

Table 17.1: Web 1.0 Vs Web 2.0

Feature	Web 1.0	Web 2.0
Type of Interaction for user	One-way	Two-way
User Participation	Authoritarian	Democratic
Reading and writing capability	Passive	Active
Change of Content	Static	Dynamic
Nature of Web Content	Closed	Collaborative
Reaching audience	Pull Technology	Push Technology

The key point between Web 1.0 Vs Web 2.0 is like Read Vs Read & Write. In Web 2.0 the 'Top-Down' approach has been replaced with 'Bottom-Up' approach where the user decides the kind of content. The user can now use web as a platform to perform different tasks like image sharing, email, editing information online etc which previously were done with the help of different software packages or utilities. Now, the user can interact and contribute to the web pages of other people or organisations instead of simply reading them.

The user has become the king of the web as he/she can generate the content on the web as per convenience or choice. The users can rate or tag the web content. Web 2.0 has brought a convergence of different systems at one place, like you may find different systems of editing, collaboration, image sharing etc at one place only.

The social context of the content has changed the way we used to use the web. People and communities are now creating content and services as per their needs and goals. People with similar interests have come closer now.

17.2.2 Technology and Standards

Data is the backbone of Web. All the major Internet applications are based on some specialised database (O'Reilly, 2009) like: Google's web crawl, Yahoo!'s directory (and web crawl), Amazon's database of products, eBay's database of products and sellers, MapQuest's map databases, Napster's distributed song database, etc. Web 2.0 technologies allow users to store all kind of data. With ever increasing volume of data on the Internet, there is a constant need for its access, search, synchronisation, movement and managing data from one repository to another and from one network to another network. This need has given rise to a new kind of Internet based services like:

- Internet - connectivity and regional Internet caching
- Internet - Filtering
- Application training
- Learning management system (LMS) hosted service delivery
- LMS - development
- Third-party LMS procurement and management
- Online community development and hosting
- Firewall intrusion protection
- Personal workspace, shared folders/library/ search
- Portal controlled filtering
- Unified communications (UC): email, Web mail and filtering
- UC: videoconferencing - desktop and meeting room; white boarding; application sharing
- UC: collaboration - instant messaging
- Web site hosting
- Content : hosting - external and internal
- Content: delivery - Webcasting and broadcasting
- Supporting content development

Some of the standards and technologies that are used in the Web 2.0 are as follows:

- **OpenID:** If you have ever tried to write a comment on a blog, you may have noticed that before allowing your comment to appear on the blog,

it asks you to log in. There you are provided some choices on how you wish to log in to that site. You may be asked to use your email account of some service provider like Google or Yahoo, or it asks you to use your OpenID. OpenID is a form of single digital identity across the web and is already used by providers like Google, Microsoft, Yahoo, AOL, and MySpace etc. With the help of this digital identity you can easily log on to a site and interact or contribute.

- **RSS:** Let's go back to Unit 16, where you studied about RSS in details. Yes, you remembered it correctly; RSS is an acronym for "Really Simple Syndication". Maybe while surfing websites you have already noticed the orange RSS icon. It was developed by Netscape in 1999 and is used on websites to allow the publication of recurrently updated items from an external source. Feeds allow you to have new content delivered to a computer or mobile device as soon as it is published. Once you set the preference for an item for RSS feed, the information will come to you, instead of you searching the internet for that information. We discussed about RSS in detail in the previous unit.
- **OAuth:** With the help of OAuth you can publish and interact with protected data on the Internet. This may happen when an Internet based application you are using needs more information from you like your date of birth or from a person who has logged on to a site via his OpenID asking for email address. In that case if the required information is stored in a different location, retrieving that information may be difficult and time consuming by the user. In that case, OAuth asks the user about the location of that information and the related password and then retrieves that information. You must have experienced this while using social networking applications. OAuth enables the application to access data for one service to be accessed located within a subset of another service over a secure data protocol.
- **Microformat:** These are a set of simple, open data formats used to represent data in XHTML. Microformats embed these XHTML data directly into the web pages which is then accessed or viewed by the user with the help of an internet based application or service (for example through some search engine or browser plug-in). Microformats enable adding context to information so that other services can use that on automated basis.
- **Ajax** (shorthand for **A**synchronous **J**avascript and **X**ML) is a group of interrelated web development techniques used on the client-side to create interactive web applications. With Ajax, web applications can retrieve data from the server asynchronously in the background without interfering with the display and behavior of the existing page. The use of Ajax techniques has led to an increase in interactive or dynamic interfaces on web pages as in Web 2.0. Some other technologies that make Ajax are HTML, XML, XHTML, CCS, XSLT, XMLHttpRequest, Document Object Model and Javascript.
- **Javascript** is an object oriented scripting language that enables enhanced interactivity by providing a dynamic website. The JavaScript is used to write functions that are embedded in or included from HTML pages to interact with the Document Object Model (DOM) of the page. Some simple examples of this usage are:
 - Pop up windows in a page.
 - Validation of input values in web forms to make sure that they will be accepted before they are submitted to the server.
 - Changing images as the mouse cursor moves over them.

JavaScript code can run locally in a user's browser (rather than on a remote server), and it can respond to user actions quickly, making an application feel more responsive. Furthermore, JavaScript code can detect user actions which HTML alone cannot, such as individual keystrokes. Applications such as Gmail take advantage of this: much of the user-interface logic is written in JavaScript, and JavaScript dispatches requests for information (such as the content of an e-mail message) to the server.

- **XML** (Extensible Markup Language) is an application profile of Standard Generalized Markup Language that believes in the use of markup should describe a document's structure and other attributes, rather than specify the processing to be performed on it. It also postulates that markup should be rigorous so that programs and data bases can be used for processing documents as well.

We do not intend to discuss much on technologies here, and therefore, expect you to have some idea about the background of web 2.0 rather than having detailed view on the specific technologies. Before moving on to understand big ideas of Web 2.0, let us have a break and attempt the Check Your Progress given below.

Check Your Progress 17.1

- Notes:** a) Write your answer in the space given below.
b) Compare your answer with the one given at the end of this unit.

Explain three technology and standards for Web 2.0

.....

.....

.....

.....

.....

17.2.3 Big Ideas of Web 2.0

JISC Technology and Standards Watch (TechWatch) report highlights Web 2.0 services and applications like blogs, wikis, social bookmarking and networking, RSS and video sharing. It also analyses some of the recent developments related to the field of web technologies, like social networking, aggregation, filtering and tracking content. This report indicates that there are at least six big ideas of Web 2.0 which shall change the way the people interact. These big ideas are:

Individual production and user-generated content

The User Generated Content is also known by the name of Self-publishing or Personal Publishing (Downes, 2004) and 'self expression'. The web has enabled users to contribute materials for programmes, news, documentaries or all other kind of programming wherein the users can input their content generated through their cameras, mobile phones or other devices. You must have noticed that now-a-days the news channels in India have started 'citizen journalism' asking citizen to send their news or photos or stories to be broadcast.

Harnessing the power of the crowd

This is also known as 'Wisdom of Crowds (WoC)' (which incidentally is the title of a book written by James Surowiecki) wherein he identified three types of problems (cognition, coordination and cooperation) and how they can be solved through group efforts. O'Reilly (2005) explained the concept of WoC as "harnessing the collective intelligence". One such example is Cloudmark (a collaborative spam filtering system) which reflects 'the individual decisions of email users about what is and is not spam, outperforming systems that rely on analysis of the messages themselves' (p. 2). The Cloudmark system is a representative of distributed human intelligence where in simple terms it can be said that here media content generation is outsourced to crowd logged into the Internet. Like multimedia sharing sites (Flickr and YouTube) have created a second generation of websites where user generated content can be re-used. *Shutterstock* and *Fotolia* are such other web-based stock photo or video databases where the amateur content producers and anyone who wants to use the content can collaborate.

Data on an epic scale

Since Web 2.0 allows users to generate content, therefore the volume of data on the Internet is ever-increasing. Database management and networking have developed as the core competency for the people involved to deal in with this data on an epic scale. Google, Amazon, Yahoo or Ebay like companies have voluminous data which is increasing day by day as new content is being generated and added to the pool.

Architecture of participation

The architecture of participation indicates the service where user content generation and collaborations are equally important and put into effect. Take the case of Bit Torrent where users download the data but make that data available for others to download too. Therefore both the data and bandwidth are made available as more and more people are involved in the network. This model is based on the premise of ethics of cooperation, you downloaded the data so let others also download it from your source.

Network effects

Klemperer (2006) and Liebowitz and Margolis (1994) described network effect as an increase in value to the existing users of a service when more and more people start using it, there is more interaction among themselves. Understand it with an example of Microsoft Office products. It is one of the most successful software products because more and more people started using it (because someone else was using it) and thus it became easy for people to share documents with each other. Therefore not only the user was benefited but also the software company too. There are other services too, take for example the case of Facebook. Once you add someone to your friends list, others are added from their friends list and thus network grows.

Openness

Openness deals with access, control and rights of digital content in terms of legal, political, and cultural settings. Web 2.0 services are based on open standards, using open source software, allowing use of free data, re-using data etc. Take the case of Open source browser Firefox and its extensible plug-ins where users are allowed to experiment to bring improvement to the software.

Check Your Progress 17.2

Notes: a) Write your answer in the space given below.

b) Compare your answer with the one given at the end of this unit.

Explain the meaning of “Wisdom of Crowd”.

.....

.....

.....

.....

.....

17.2.4 Key Web 2.0 Services

Web 2.0 offers many services pertaining to different areas like social networking, collaboration, content sharing in terms of photo sharing or document sharing or video sharing etc. Some of the key Web 2.0 services are:

- Blogs
- Wikis
- RSS and syndication
- Tagging and social bookmarking
- Multimedia sharing
- Audio blogging and podcasting
- Newer Web 2.0 services and applications

You will be reading about blogs and wiki in the next sections, whereas about RSS we have studied in Unit 16. Tagging is adding a keyword to a digital object (any picture or video clip or a website) to describe it. Social Bookmarking allows sharing common features and allows users to create a list of bookmarks or favourites at a central server so that these can be shared with other users. See for example, <http://delicious.com/>

Multimedia sharing allows users to store and share multimedia content like you must have seen or used YouTube (video), Flickr (photographs) and Odeo (podcasts). Social Networking, Aggregation services, Data ‘mash-ups’, and Tracking and filtering content are some of the examples of newer Web 2.0 services and applications.

17.3 BLOGS

A blog is a personal website that contains content organized like a journal or a diary. Each entry is dated, and the entries are displayed on the web page in reverse chronological order, so that the most recent entry is posted at the top. Readers catch up with blogs by starting at the top and reading down until they encounter material they’re already read.

Though blogs are typically thought of as personal journals, there is no limit to what may be covered in a blog. It is common for people to write blogs to describe their work, their hobbies, their pets, social and political issues, or news and current events. And while blogs are typically the work of one individual, blogs combining contributions of several people, ‘group blogs’, are also popular.

While the earliest blogs were created by hand, blogging became widely popular with the advent of blog authoring tools. Among the earliest of these were Userland and LiveJournal (www.livejournal.com). Today, most bloggers use either Google's popular Blogger service (www.blogger.com) or WordPress (www.wordpress.com). These services allow users to create new blogs and blog posts by means of simple online forms; the writer does not need to know any programming or formatting. As a result, blog aggregation services such as Technorati (www.technorati.com) have reported that tens of millions of blogs have been created (Technorati, 2008).

Blogs are connected to each other to form what is commonly known as the 'blogosphere'. The most common form of connection is from blogs to link to each other. Blog authors may also post a list of blogs they frequently read; this list is known as a 'blogroll'. Blogs may also be read through special readers, known as 'RSS readers', which aggregate blog summaries produced by blog software. Readers use RSS readers to 'subscribe' to a blog. Popular web-based RSS readers include Google Reader and Bloglines. You have studied about RSS in the previous unit.

While blogs once dominated the personal publishing landscape, they now form one part in a much more diverse landscape. Many people who formerly write blogs are using social networking sites such as MySpace (www.myspace.com) or Facebook (www.facebook.com). Others use 'microblogging' services such as Twitter (www.twitter.com). And blogs, which began as text-based services, have branched into audio blogs (also known as 'podcasts') and video blogs ('vlogs'). Authors typically upload a wide range of multimedia content such as art to sites like deviantart (www.deviantart.com/), videos to hosting services such as YouTube (www.youtube.com), slide shows and PDFs to SlideShare (www.slideshare.net) and photos to sites like Flickr (www.flickr.com).

17.3.1 Using Blogs in Education

Blogs are widely popular in education, as evidenced by the 400 thousand educational blogs hosted by edublogs (www.edublogs.org). Teachers have been using them to support teaching and learning since 2005 (Downes, 2004). Through years of practice, a common understanding has formed around the benefits of the use of blogs in education (see <http://anne.teachesme.com/2007/01/17/rationale-for-educational-blogging/>).

Because blogs are connected, they can foster the development of a *learning community*. Authors can share opinions with each other and support each other with commentary and answers to questions. For example, the University of Calgary uses blogs to create learning communities.

Additionally, blogs give students ownership over their own learning and an *authentic voice*, allowing them to articulate their needs and inform their own learning. (Uniservity, 2007) Blogs have been shown to contribute to identity-formation in students (Bortree, 2005).

Further, blogging gives students a genuine and potentially *worldwide audience* for their work (Aguilar, 2009). Having such an audience can result in feedback and greatly increase student motivation to do their best work (See <http://www.big6.com/2006/06/12/motivating-middle-schoolers-grades-5-8/>). Students also have each other as their potential audience, enabling each of them to take on a leadership role at different times through the course of their learning.

Moreover, blogging helps students see their work in different subjects as *interconnected* and helps them organize their own learning. Working with the teacher and informed by blogs authored by experts in the field, students can conduct a collective enquiry into a particular topic or subject matter creating their own interpretation of the material.

Blogs teach a variety of skills in addition to the particular subject under discussion. Regular blogging fosters the development of writing and research skills. Blogging also supports digital literacy as the student learns to critically assess and evaluate various online resources.

17.3.2 How to Use Blogging in Learning?

- *Begin simply.* Most uses of blogs in the classroom began with the instructor using blogs to post class information such as lists of readings and assignment deadlines (Downes, 2004). This fosters in the teacher a familiarity with the technology and with students a habit of regularly checking the online resource.
- *Lead by example.* Before requiring students to blog, instructors should lead by example, creating their own blogs and adding links to interesting resources and commentary on class topics. This not only produces a useful source of supplemental information for students, it creates a pattern and sets expectations for when students begin their own blogging.
- *Read.* Students should begin their entry into blogging by reading other blogs. Teachers should use this practice not only to demonstrate how other people use blogs to support learning but also to foster critical thinking and reading skills. Teaching how to *respond* to blog posts is as important as creating blog posts.
- *Create a context.* Like the author facing a blank sheet of paper, a blogger will be perplexed unless given something specific to write about. Have students blog about a current issue, about a specific piece of writing, or some question that comes up in the course.
- *Encourage interaction.* Blogging should not be a solo activity. Encourage bloggers to read each other's works and to comment on them. Encouraging students to set up an RSS reader with each other's blogs will make reading and commenting a lot easier. Teachers, also, should subscribe to student blogs and offer comments, again setting an example of the expected practice.
- *Respect ownership.* A student blog becomes important because it is a manifestation of his or her own work. However, to have this value, a student's ownership of a blog must be genuine. While reasonable limits or codes of practice (See http://www.digitalquery.com/2005/08/hill_knowlton_o.html) need to be respected, student bloggers should have the widest latitude possible for personal expression and opinion.
- *Address issues immediately.* The most significant danger to students online is posed by other students. In particular, bullying (or ragging) is a significant problem (See <http://en.wordpress.com/tag/school-bullying/>). It is important to spot instances of bullying as soon as they occur and to take steps to prevent further incidents. Teachers should educate themselves as online bullying can be invisible and hard to address.

Check Your Progress 17.3

- Notes:** a) Write your answers in the space given below.
b) Compare your answers with those given at the end of this unit.

1) List three blogging services on the web.

.....

.....

.....

.....

.....

2) List four benefits of blogging for learning.

.....

.....

.....

.....

.....

17.4 WIKIS

A wiki is a website which can be edited by oneone having an account on the wiki platform. Wiki is a great tool for collaboration over the Internet and a store house of information. Allowing anyone to add, delete or edit the content on the wiki pages has made it an effective tool for collaborative writing.

The term wiki has been taken from Hawaii Language, where they call it *wiki* (*wiki* means quick or fast). In simple terms, wiki can be taken as simplified webpages where all the previous versions of a page are also stored. This enables one to retrieve any past page. There are different tools inbuilt in a wiki system to keep track of changing information on wiki pages or uploading images, audio or video or providing links (URL) to internal pages or external websites (external links).

History of Wiki

WikiWikiWeb was the first Wiki software which was developed by Ward Cunningham in 1994. He described it as “the simplest online database that could possibly work.” [http://en.wikipedia.org/wiki/Wiki#cite_note-2#cite_note-2]. The WikiWikiWeb was installed on the Internet domain C2.com on 25 March 1995. Cunningham is said to be inspired by Apple’s HyperCard system (this system allowed users to create ‘card stacks’ by creating links among various cards). The Wikis gained popularity as collaborative software and were being used for project communication, intranets and documentation where one user can comment on and edit the text of other user. Wikis are dynamic databases for creating, sharing, updating, using and searching information on the web. It is an open space or platform to engage in sharing and learning.

17.4.1 Strengths and Limitations

In the *STRIDE Handbook 8: E-Learning*, Zhang and DeLoose (2009) describe the benefits of wiki as follows: “As powerful cognitive tools (Jonassen, 2000; Jonassen & Howland, 2003), wikis allow learners to contribute actively to knowledge construction, networking and collaboration. A wiki is an ever-growing web of knowledge that any user may append. A wiki may be reused by many class sessions and different groups of learners, with content being added to and modified on a continual basis. Wiki-related learning activities enable collaborations among different learners, instructors, classes, schools, universities, and experts from anywhere across the globe (Bonk & Zhang, 2008). Wiki applications facilitate teaching and learning by providing shared knowledge repositories that are constantly updated and corrected. Learners may not only use existing wikis for information and resources, but also create new wikis or add to existing ones, which further empowers them with a strong sense of ownership in the learning process. Engaged in a wiki project, such as writing a wikibook, learners have opportunities to share knowledge through active, meaningful, and collaborative learning and research. Changing from passive knowledge receivers to knowledge creators, learners are highly motivated to work and collaborate continuously in wiki-related learning tasks (Watson, Boudreau, York, Greiner, & Wynn, 2008). Wiki-related learning activities may also address the demanding needs of generational learners (Zhang & Bonk, in press) and different types of learning preferences and learner needs (Bonk & Zhang, 2008; Zhang & Bonk, 2008). The easy function of incorporating multimedia also enables learners to add various forms of expressions in wikis, addressing multiple intelligences (Zhang & Bonk) without complex technical operations (Choy & Ng, 2007)”.

Strengths

- Free, openly available to anyone (you need an internet connection to access pages).
- You can write on the topic of your interest where others can contribute to your content.
- Since others can contribute to your content, it encourages peer review of content and quality of content may improve.
- The wiki pages can be edited by any user (who is authorised to do so, in other words, who is a registered user).
- The history of all the pages created is saved and any time you can revert back to a page.
- The ‘Watch’ feature enables to be informed of any change of content on that page.
- It provides a collaborative platform for developing and sharing content, different people can work from different parts on same document.
- You can include online quizzes and assessment activities in your course modules.
- Other software utilities and applications can be easily integrated into wiki pages, like YouTube videos, Slideshare presentations, Google Calendar, MindMap etc.
- The wiki editing skills are easy to learn and use.
- As soon as you edit and save a page, it is published on the web, so it is instantaneous in nature.
- Licensing costs can be taken care of because there is a wide range of open source software that you can install for institutional wiki.

Limitations

- There can be incomplete information or page on a wiki platform.
- Since anyone can edit the pages, there are chances that incorrect information can be uploaded on to the pages. (But since others can read that and correct it, so this aspect can be taken care of). Also at systems level editing can be blocked if required.
- The educational institutions are yet to recognise it as a full scale mode of instruction delivery as there are questions about the validity and reliability of content.
- Since there is no formal structure of wiki, therefore the information can be disorganised if page designing is not done carefully.

17.4.2 Software for Wiki

There are many software available for creating your own wiki. The Wikimedia Foundation's MediaWiki is one of the most widely used open source wiki technology that is robust enough to also host an encyclopaedia (e.g. Wikipedia and its different versions such as wikibooks, wikiversity, etc.). you may like to host a media wiki server for which you need the following:



Figure 17.1: Webpage of Media Wiki

In order to use wiki for your teaching and learning as a teacher, you may just create an account on a free wiki server. There are plenty available on the net. However, we would recommend you to consider creating your account on WikiEducator (www.wikieducator.org). They provide you a host of online training materials to learn and also conduct online/offline workshops to provide basic training on use of wiki.

Check Your Progress 17.4

Notes: a) Write your answers in the space given below.

b) Compare your answers with those given at the end of this unit.

1) Give three reasons for use of Wiki in teaching and learning.

.....

.....

2) Fill in the blanks.

- a) Wiki is derived from *wiki wiki* in language, meaning quick, quick.
- b) developed wiki in 1994.
- c) Wikipedia uses software.

17.5 SOCIAL NETWORKING

Social networking is a term in common use only since 2003. The term has been defined by many and generally viewed as referring to networked tools that allow people to meet, interact and share ideas, artifacts and interests with each other. Social networking applications have been phenomenally popular with sites such as Facebook, MySpace, SecondLife and LinkedIn counting their user numbers in the tens of millions. Social networking to date has found applications primarily in the contexts of informal learning and entertainment however there is growing interest in its use in formal education in face-to-face, distance and blended modes. Social networking in the context of distance education can be defined as “networked tools that support and encourage learning through face-to-face and online interactions while retaining individual control over time, space, presence, activity and identity” (Anderson, 2006). Key to understanding both the power and the disruptive affordances of social networking is what Dalsgaard (2008) refers to as transparency – making visible and retrievable the activities, ideas, communications, artifacts and interests of others.

There are many different network learning applications. Some are generalized and multi-faceted application systems that combine social networking applications including blogs, wikis, profiles, resource tagging, documents sharing and other services. Conversely, there are specialized social networking applications focusing on particular applications such as language learning, meeting people who live near by or those who share common interest, hobbies or goals, scheduling and many other applications. The web 2.0 aggregation site <http://gotoweb20.net> currently lists over 2800 applications - most of which could be classified as social networking applications.

For e-learning applications social networking serves three broad functions (Anderson, 2009):

- **Socializing:** Many forms of distance education and their e-learning derivatives have focused on the provision of content to students and provided only limited contact between student and teacher and often no opportunity for student-student interaction. This lack of social interaction, help seeking and provision, and lack of general interpersonal communication and support opportunities has been associated with lack of social integration and resulting higher levels of attrition in both distance education and e-learning (Kember, 1995; Rovai, 2003; Tinto, 1987; Woodley, 2004). Of particular concern in modern e-learning is the inability of institutions to provide contact information to fellow students owing to restrictions on release of private student information to other students. Thus, it can easily happen that students enrolled in the same course, living in the same apartment building, have no opportunity to connect with each other for mutual support, engaging in ‘study buddy’ or study group type interaction, engage in cooperative

or collaborative work or to build social networks and social capital with other students. Social networking first allows learners to find each other by browsing the profiles of other learners. Profile systems encourage learners to share their interests, aspirations, locations, hobbies, past course completions, photographs and other personal information. Typically systems provide hot links that provide easy electronic access to other students who share these interests or characteristics. However, it is critical that students have control over the release of this personal information (Anderson, 2009). Some social networking applications require wide distribution across the entire Internet to be effective, whereas some information can be effectively shared in restricted subsets such as registered students at an institute, those in a particular class, programme or club or even particular 'friends' of that student. There is no single best permission setting, rather students need to be able to set, and change as necessary, the extent of the distribution of personal information and content they create.

- **Sharing:** One of the most common informal and formal learning applications of network software is the capacity to store, organize and annotate network resources. These include favorite web sites, photographs, music, travel recommendations, references, books and many other electronic resources that people want to be able to quickly retrieve, annotate and share with others. If these resources are stored in accessible networked locations and tagged or identified by the user, they can be combined with other people's resources to create aggregated collections. These collections allow users to discover what others have found, to rate and comment on these resources and generally add value to the individual collection by collective aggregation (Dron & Anderson, 2007). These shareable resources need not be restricted to those created by others. Rather resources created by students and teachers such as learning diaries (blogs), student created learning resources (portals, wiki contributions, original music, multi-media art, reports and essays) can also be shared. These collections need not be bound to particular courses, cohorts or even institutions. Rather they can be used to create permanent, yet continuously growing and evergreen resources as they are used and augmented by multiple groups of learners and educators.
- **Sojourning:** To sojourn means to travel or work with others. There is ample evidence from both class room delivery and distance education at all levels of formal education that collaborative and cooperative learning increases learning effectiveness, motivation, persistence and develops interpersonal and communications skill collaborative (Fisher, Phelps & Ellis, 2000; Gokhale, 1995; Johnson & Johnson, 1994; Kaplan-Leiserson, 2003; Kaye, 1991; Kreijns, Kirschner & Jochems, 2002; Shindler, 2004; Springer, Stanne & Donovan, 1999; Stacey, 1999). However, providing collaborative learning opportunities for distance education students has, until the development of networking software, always been inconvenient, restrictive and often expensive (Paulsen, 2008). Social software allows groups of students to efficiently schedule their activities, meet online via text chat, audio, video or immersion technologies and to engage collaboratively in a variety of brainstorming, mind mapping, group games, simulations, project management, and other types of organizational, administrative and learning activities.

17.5.1 Challenges of Utilizing Social Networking in e-Learning

Like all technologies, the use of social networking presents both opportunities and challenges to educators and learners. Of course, social

networking requires easy access to the Internet and some applications (notably immersion technologies such as SecondLife) require high speed connections and relatively advanced computer hardware. In addition, some educational institutions and workplaces actively discourage or block access to social networking sites in mistaken attempts to constrain learner exploration and use of these potentially distracting tools. *Second*, social networking is new and novel and can challenge students' and teachers' network and computer efficacy and their capacity to easily adapt to new learning tools and contexts. *Third*, social networking is a very disruptive technology (Christensen, 1997; Christensen, Horn & Johnson, 2008) that challenges many of our notions of privacy, individual and institutional control – generally moving control from the institution and the teacher to the learner. *Fourth*, social networking provides tools that can be used for plagiarism, cheating, harassment and other types of academic and social misconduct. None of these challenges are insurmountable, but they highlight the challenges of rapid and wholesale implementation and point to the need for pilot projects that guide adaptive policies, training and support development.

17.5.2 Using Social Networking Effectively

The use of social networking evolves a process of exploration and learning for all participants. Many of the technologies and their applications are emergent, meaning that it is impossible to predict in detail what will be the outcomes of their use. However, the potential advantages described above give promise that social networking learning designs will prove more effective, efficient and motivating ways to support learning than any previous forms – including both traditional campus based and distance education. Thus, educators should be piloting educational applications in their courses to provide opportunities for themselves and their students to explore and evaluate the effect of social networking tools use on their formal and informal learning. Many social networking tools are open source, can be used in trial applications or with advertising support at very low or no cost. Educators should however note the pervasive interest in busy and often instrumental learners in being rewarded course credits for their use and learning with these tools – thus suggesting development of compelling but optional and graded activities that enhance e-learning and face-to-face courses. Finally, educators would create ways in which learners can help each other to learn and overcome logistical, technical, institutional and learning challenges. It is unrealistic to expect the high degree of institutional support for these emerging technologies as we have attempted to provide for earlier administrative and educational technologies. However, by guiding and facilitating the use of social networking to encourage learners to support each other, we can create largely self-supporting and cost effective learning communities.

Check Your Progress 17.5

Notes: a) Write your answers in the space given below.

b) Compare your answers with those given at the end of this unit.

1) Give three examples of social networking websites.

.....

.....

.....

2) Describe three function of social networking in the context of education.

.....

.....

.....

.....

.....

.....

.....

17.6 LET US SUM UP

In this unit, we discussed how the web has emerged from its simple static form to its dynamic form called as Web 2.0. This is also called as Read/Write web. You were introduced to the technology and standards of web 2.0 technologies. In addition we examined six big ideas of web 2.0 and some of the key services. At the end of this unit by now you must have gained an insight into how the blogs are important tools to teachers and students. We discussed the use of wikis, and strengths and limitations for teaching and learning. There are different kinds of software available to create wiki and we highlighted the use of MediaWiki and WikiEducator. Social networks have also revolutionised the way we are interacting with others. Towards the end of the unit on web 2.0, we also emphasised the role of social networks in *socializing, sharing and sojourning*.

17.8 KEYWORDS

Ajax: is short for Asynchronous JavaScript and XML that is used for web development for client side interactivity.

Blogs: is an abbreviation for 'web log'. It is a type of website that people use to update regularly, where entries are shown on date wise as in a diary.

Javascript: is a programming language for web development.

Social networking: is a set of software system that provides people to join, share, interact and build a communication network on the web.

Social bookmarking: is a method for Internet users to share, organize, search, and manage bookmarks of web resources.

Tagging: is a process of giving keyword (tag) by the user to an object on the Internet.

Wiki: is a website that allows the easy creation and editing of any number of interlinked web pages via a web browser using a simplified markup language or a WYSIWYG text editor.

17.9 REFERENCES AND FURTHER READINGS

Aguilar, E. (2009). Blogs gives students an audience, Available at <http://www.edutopia.org/student-blogging-classroom-tips>

Anderson, C. (2006). The Long Tail: How endless choice is creating unlimited demand. Random House Business Books: London, UK.

- Anderson, T. (2009). My place or yours? Hosting Web 2.0 Education. *Virtual Canuck* Retrieved April 2009 from <http://terrya.edublogs.org/2009/04/08/my-place-or-yours-hosting-web-20-education/>.
- Anderson, T. (2009). Social Networking, in Mishra, Sanjaya (2009). *E-Learning* (STRIDE Handbook 8), New Delhi: IGNOU
- Bandura, A. (1977). *Social Learning Theory*. Englewood Cliffs, N.J: Prentice-Hall.
- Bold, M. (2006). Use of Wikis in Graduate Course Work. *Journal of Interactive Learning Research*.17(1), 5-14.
- Bonk, C. J., & Zhang, K. (2008). *Empowering Online Learning: 100+ Ideas for Online Reading, Reflecting, Displaying, and Doing*. San Francisco, CA: Jossey-Bass.
- Bortree, D.S. (2005). Presentation of self on the Web: an ethnographic study of teenage girls' weblogs. *Education, Communication & Information*, 5(1), 25-39
- Bruner, J. (1986). *Actual minds, possible worlds*. Cambridge: Harvard University Press.
- Choy, S. O., & Ng, K. C. (2007). Implementing Wiki Software for Supplementing Online Learning. *Australasian Journal of Educational Technology*. 23(2), 209-226.
- Christensen, C. (1997). *The innovator's dilemma - When new technologies cause great firms to fail*. Cambridge: Harvard University Press.
- Christensen, C., Horn, M., & Johnson, C. (2008). *Disrupting Class: How Disruptive Innovation Will Change the Way the World Learns*. New York: McGraw Hill.
- Cole, M. (2009). Using Wiki Technology to Support Student Engagement: Lessons from the Trenches. *Computers & Education*. 52(1), 141-146.
- Dalsgaard, C. (2008). *Social networking sites: Transparency in online education*. Paper presented at the European University Information Systems Organisation. Retrieved June 2008 from <http://eunis.dk/papers/p41.pdf>
- Downes, S. (2004). Educational Blogging, Educause, September/October, 14-26. Available at <http://net.educause.edu/ir/library/pdf/ERM0450.pdf>
- Dron, J., & Anderson, T. (2007). *Collectives, Networks and Groups in Social Software for E-Learning*. Paper presented at the Proceedings of World Conference on E-Learning in Corporate, Government, Healthcare, and Higher Education Quebec Retrieved Feb. 2008 from www.editlib.org/index.cfm/files/paper_26726.pdf.
- Engstrom, M. E., & Jewett, D. (2005). Collaborative Learning the Wiki Way. *TechTrends: Linking Research & Practice to Improve Learning*. 49(6), 12-16.
- Fisher, K., Phelps, R., & Ellis, A. (2000). Group processes online: Teaching collaboration through collaborative processes. *Educational Technology and Society*, 3(3), 484-495
- Gokhale, A. (1995). Collaborative learning enhances critical thinking. *Journal of Technology in Education*, 7(1) Retrieved June 29,2004 from <http://scholar.lib.vt.edu/ejournals/JTE/jte-v7n1/gokhale.jte-v7n1.html>.
- Hase, S., & Kenyon, C. (2000). From Andragogy to Heutagogy. *UltiBase* Retrieved Dec 28, 2005 from ultibase.rmit.edu.au/Articles/dec00/hase2.htm.
- Horn, J. (2008). Human research and complexity theory. *Educational Philosophy and Theory*, 40(1)
- Johnson, D., & Johnson, T. (1994). *Learning Together and Alone: Cooperative, Competitive, and Individualistic Learning*. Toronto: Allyn and Bacon.
- Jonassen, D. H. (2000). *Computers as mindtools for schools: Engaging critical thinking* (2nd ed.). Upper Saddle River, NJ: Prentice Hall.
- Jonassen, D. H., & Howland, J. (2003). *Learning to solve problems with technology: A constructive perspective* (2nd ed.). Upper Saddle River: Pearson Education.
- Kaplan-Leiserson, A. (2003). We Learning: Social software and e-learning. *Learning Circuits*(December) Retrieved Dec 20, 2003 from <http://www.learningcircuits.org/2003/dec2003/kaplan.htm>.
- Kaye, A. (1991). *Collaborative Learning Through Computer Conferencing*. Berlin: Springer-Verlag.
- Kember, D. (1995). *Reconsidering open and distance learning in the developing world*. Englewood Cliffs, NJ.: Education Technology.

- Klemperer, P. (2006). Network Effects and Switching Costs: Two Short Essays for the New Palgrave. Working Paper series. Social Science Research Network. Available at: http://papers.ssrn.com/sol3/papers.cfm?abstract_id=907502 [accessed 15/10/09].
- Kreijns, K., Kirschner, P. A., & Jochems, W. (2002). The Sociability of Computer-Supported Collaborative Learning Environments (Vol. 5).
- Lamb, B. (2004). Wide Open Spaces: Wikis Ready or Not. *EDUCAUSE Review*. 39(5), 36, 38, 40, 42, 44-46, 48.
- Leuf, B. & Cunningham, W. (2001). *The Wiki way: quick collaboration on the Web*. Boston, MA: Addison-Wesley Longman Publishing.
- Leuf, Bo (2001). The Wiki Way: Quick Collaboration on the Web. Addison-Wesley.
- Liebowitz, S. J., Margolis, S. (1994). Network Externality: An Uncommon Tragedy. *Journal of Economic Perspectives*, vol. 8, no. 2, Spring 1994. American Economic Association: USA. Also available online at: <http://www.utdallas.edu/~liebowit/jep.html> [accessed 24/07/09].
- Mishra, Sanjaya (2009). *E-Learning* (STRIDE Handbook 8), New Delhi: IGNOU
- Oatman, E. (2005). Make Way for Wikis. *School Library Journal*. 51(11), 52-54.
- O'Reilly, T. 2005a. *What is Web 2.0: Design Patterns and Business Models for the next generation of software*. O'Reilly website, 30th September 2005. O'Reilly Media Inc. Available online at: <http://www.oreillynet.com/pub/a/oreilly/tim/news/2005/09/30/what-is-web-20.html>
- Paulsen, M. F. (2008). Cooperative Online Education. *Seminar Net*, 4(2) Retrieved Oct. 2008 from http://www.seminar.net/images/stories/vol4-issue2/paulsen_-_cooperative_online_education.pdf.
- Rovai, A. (2003). In search of higher persistence rates in distance education online programs. *Internet in Higher Education*, 6(1), 1-16
- Shindler, J. (2004). Greater than the sum of the parts? Examining the soundness of the collaborative exam in teacher education courses. *Innovative Higher Education*, 28(4), 273-283
- Siemens, G. (2005). A Learning Theory for the Digital Age. *Instructional Technology and Distance Education*, 2(1), 3-10 Retrieved Oct. 2005 from <http://www.elearnspace.org/Articles/connectivism.htm>.
- Springer, L., Stanne, M., & Donovan, S. (1999). Effects of small-group learning on undergraduates in science, mathematics, engineering and technology: A meta-analysis. *Review of Educational Research*, 16(1), 21-51
- Stacey, E. (1999). Collaborative Learning in an Online Environment.
- Stahmer, T. (2006). Think Outside the Blog. *Technology & Learning*. 26(6), 28.
- Tapscott, Don (2008). *Wikinomics: How Mass Collaboration Changes Everything*. Portfolio Hardcover.
- Technorati (2008). State of the Blogosphere, Available at <http://technorati.com/blogging/state-of-the-blogosphere>
- Tinto, V. (1987). *Leaving college: Rethinking the causes and cures of college attrition*. Chicago, IL: University of Chicago Press.
- Trentin, G. (2009). Using a Wiki to Evaluate Individual Contribution to a Collaborative Learning Project. *Journal of Computer Assisted Learning*. 25(1), 43-55.
- Uniservisty (2007). Removing barriers and creating new opportunities for learning Available at http://www.uniservisty.com/_library/download/www/PDF/Best%20Practice/cLc%20Best%20Practice%20Student%20Voice%20and%20Choice.pdf
- Vygotsky, L. (1978). *Mind in society: The development of higher psychological processes*. Cambridge: Harvard University Press.
- Watson, R. T., Boudreau, M.-C., York, P. T., Greiner, M., & Wynn, D. E. (2008). Opening the Classroom. *Journal of Information Systems Education*. 19(1), 75-86.

- Wheeler, S., Yeomans, P., & Wheeler, D. (2008). The Good, the Bad and the Wiki: Evaluating Student-Generated Content for Collaborative Learning. *British Journal of Educational Technology*, 39(6), 987-995.
- Wikimedia Foundation. (2009). Wikimedia Foundation. Retrieved on July 12, 2009 from the Wikipedia Website: http://en.wikipedia.org/wiki/Wikimedia_Foundation
- Wikipedia. (2009). Wikipedia Retrieved April 14, 2009, from Wikipedia Web site: <http://en.wikipedia.org/>
- Woodley, A. (2004). Conceptualizing student dropout in part-time distance education: pathologizing the normal. *Open Learning*, 19(1), 47-63
- Zhang, K. & Bonk, C. J. (2008). Addressing diverse learner preferences and intelligences with emerging technologies: Matching models to online opportunities. *Canadian Journal of Learning and Technology*, 34(2), 309-332.
- Zhang, K. & Bonk, C. J. (in press). Generational learners and e-learning technology, in H. Yang & S. C-Y. Yuen (eds.). *Handbook of Research on Practices and Outcomes in E-Learning: Issues and Trends*. Hershey, PA: IGI Publishing.
- Zhang, Ke, & Stacey, D. (2009). Wikis, in Mishra, Sanjaya (2009). *E-Learning (STRIDE Handbook 8)*, New Delhi: IGNOU

17.10 FEEDBACK TO CHECK YOUR PROGRESS QUESTIONS

Check Your Progress 17.1

The three important technology standards of Web 2.0 are Ajax, JavaScript, and XML.

Check Your Progress 17.2

With the read-write abilities of the web, it is now possible to have large user base of a website that interacts with the system and amongst each other. The huge number of web users in a website can contribute many solutions through their interaction and collective intelligence. For example, a rating system can help other users to decide a product or an expert online; or for that matter, the bookmarking in a delicious site can inform us the popularity of the link.

Check Your Progress 17.3

- 1) Three blogging services on the net are:
 - a) Blogger.com
 - b) Livejournal.com
 - c) Edublogs.org
- 2) The benefits of blogging are:
 - a) Fostering the development of a learning community
 - b) Students can articulate their voice and take ownership
 - c) World wide audience to ideas
 - d) Students develop interconnection due to the network and because of the hypertext facilities

Check Your Progress 17.4

- 1) Three reason for use of wiki in teaching and learning are:
 - a) Wiki is a collaborative platform
 - b) Wiki is simple to use and open to anyone with web access
 - c) Wiki keeps history of the development of a work online, and every time it is edited the older version is archived.
- 2) (a) Hawaii, (b) Ward Cunningham, (c) MediaWiki

Check Your Progress 17.5

- 1) Three examples of social networking sites are: Facebook, LinkedIn and MySpace.
- 2) Three functions of social networking in the context of education are:
 - a) Socializing: Use of social networking can improve socialization amongst learners and develop institutional belongingness in distance education institutions.
 - b) Sharing: Social networking can develop sharing of ideas and artefacts over the network.
 - c) Sojourning: Social networking can improve collaboration and cooperative learning and provide distance learners opportunity to grown and travel together in a journey of learning.



UNIT 18 VIRTUAL CLASSROOM AND VIRTUAL REALITY

Structure

- 18.0 Introduction
- 18.1 Learning Outcomes
- 18.2 Virtual Reality in Education
- 18.3 Simulations
 - 18.3.1 Use in Education
 - 18.3.2 Virtual Laboratories
- 18.4 Web Conferencing
 - 18.4.1 Chatting
 - 18.4.2 Web Telephony
 - 18.4.3 Video Chatting and Web Conferencing
 - 18.4.4 Web Conference Tools
- 18.5 Immersive Learning
 - 18.5.1 Digital Games
 - 18.5.2 Virtual Worlds
- 18.6 Let Us Sum Up
- 18.7 Keywords
- 18.8 References and Further Readings
- 18.9 Feedback to Check Your Progress Questions

18.0 INTRODUCTION

Distance education has always been at the receiving end for being asynchronous and theory oriented. Many still believe that practical based courses can't be taught at a distance. At the same time the popular belief is that interaction increases learning. With the advancement of technology, now it is possible to have increased interaction between the teacher and the student and amongst the students on real-time basis. However, they are not available at one place, and they need only to have access to Internet, with a webcam and headphone to be present in a virtual class. Technology has increased the social presence and teacher presence in distance education courses. Many multinational companies having offices in different cities have adopted this technology to reduce travel, and costs and conduct regular meetings via web conference systems.

Practical in science and engineering areas require high tech, high cost machines; and with the advancement in virtual reality, it is possible to have virtual labs in remote areas accessed sitting in the cozy office or home of the learner. Not only the distance has been bridged due to the web conferences, but also the physical sensory touch and tactile movements are possible with the use of virtual reality. In this unit, we will give you an overview of virtual reality in education and the use of web-conference tools.

18.1 LEARNING OUTCOMES

After working through this unit, the learner will be able to:

- Describe the use of virtual reality in education;
- Identify and use simulation in education;

- *Use* different types of web conferencing tools for teaching;
- *Explain* the use of immersive learning technologies;
- *Describe* the use of Virtual Worlds in education; and
- *Discuss* the advantages of digital games.

18.2 VIRTUAL REALITY IN EDUCATION

Virtual Reality (VR) is the technology that provides almost real and/or believable experience in a synthetic or virtual way. The term refers to “a combination of high speed computers, advanced programming techniques and interactive devices designed to make computer users feel they have stepped into another world, a world constructed by computer data” (Grady, 2003).

Table 18.1: Potential Benefits of a VR Educational System

Potential Use	Benefit compared to traditional methods
Simulation of complex systems	Ability to observe system operation from a number of perspectives aided by high quality visualization and interaction.
Macroscopic and microscopic visualization	Observation of system features that would be either too small or too large to be seen on a normal scale system
Fast and slow time simulation	Ability to control timescale in a dynamic event. This feature could operate like the fast forward or rewind preview of a modern video recorder.
Allow high levels of interactivity	Most people learn faster by ‘doing’ and the VR system provides much greater levels of interactivity than other computer based systems. Provided that the interfaces are intuitive and easy to use then the degree of interactivity can be very beneficial.
Sense of immersion a powerful characteristic	In some applications the sense of scale is extremely important. For example, architecture is an area where a sense of scale is required to visualise the impact of a building design on the external environment and the the inhabitants.
Inherent flexibility/adaptability	The inherent flexibility of a VR system comes from the underlying software nature of the virtual environment. A VR system can be put to many uses by loading different application environments. This means that it is feasible to use a VR system for a range of teaching applications. This means that if the system is properly applied it will soon generate cost savings.

Source: <http://www.agocg.ac.uk/reports/virtual/vrtech/relevnc1.htm>

Virtual reality can assist students to become immersed in a learning environment where they can participate in their own learning in a technology based environment. Though, VR applications are usually designed for training requirement like aviation and vehicle simulators, medical and military training , it can also be used to help in understanding of concepts, complex systems and processes, abstract models and other non-intuitive material. While traditional notions of learning tend to focus on purely intellectual skills, VR can successfully be used to support complex understanding by stimulating and exploring all human senses. VR may be used as a means of enhancing, motivating and stimulating understanding of

certain events, especially those for which the traditional notion of instructional learning have been found inadequate or difficult.

VR has the potential to have major impact on education if appropriately used, as it supports a number of important concepts that might make a difference to education. Table 18.1 presents the potential benefits of VR in education.

18.3 SIMULATIONS

Simulation represents a powerful set of tools that can change the way instructional designers create experiences as well as the way instructors facilitate those experiences. Well designed computer-based simulations can make valuable contribution to student learning. Well planned simulations can provide an environment for conceptualizing and allow students to internalize major concepts. However, it is important that the physical characteristics of a simulated environment must inspire a learner's imagination.

Computer simulations can be powerful tools for analyzing, designing, and interacting with complex systems or processes. Well-designed computer simulations provide a model of those elements most relevant to the immediate learning objective (Lunce, 2004).

Simulations structured by authentic rules that mirror actual results can facilitate learners to model, explore, and try out a variety of strategies. Simulations may include role-playing where they can collaboratively invent, experiment, and practice in a relatively low-risk environment. Experimental simulations provide learners the opportunity to engage in situations that would otherwise be too hazardous or costly to conduct in real situation.

18.3.1 Use in Education

Aldrich (2004) identifies the following elements in educational simulation:

- Appropriately used linear, cyclical, and systems content
- Simulation genres, including branching stories, virtual products/ virtual labs, interactive spreadsheets, flight simulator; and 3D maps, as well as new genres to be introduced
- The appropriate use of genre elements, including modeling, AI, graphics, and interface
- Creating an atmosphere similar to the atmosphere in which the content will be used
- Presenting behavior to be modeled or recognized
- Feedback from a decision (or series of decisions) that shows the natural consequences of the behavior

The Defense Modeling and Simulation Office of US categorizes training simulations into three types (<http://en.wikipedia.org/wiki/Simulation>):

- Live simulation — real people use simulated (or “dummy”) equipment in the real world;
- Virtual simulation — real people use simulated equipment in a simulated or virtual environment viz. ;
- Constructive simulation — simulated people use simulated equipment in a simulated environment viz. war gaming.

There are innumerable examples of use of simulations in education and training. Some important ones are elaborated here to give a glimpse of their usage in educational set up:

- 1) The **NASA Glenn Research Center** has developed a series of interactive computer programs for students to foster hands-on, inquiry-based learning in science and math. All of the programs are Java applet based which run in browser, on-line, over the World Wide Web. (http://www.grc.nasa.gov/WWW/k-12/freesoftware_page.htm)
- 2) **Real Lives 2010** is a unique, content rich and empathy-building real world, real life simulation that challenges life skills (not your hand-eye coordination) as one has to make difficult, high-stakes choices that may lead to success, or failure. **Real Lives 2010** is a role playing kind of simulation which makes the world come alive on a personal and global level. It has exciting features 3D animated graphics of all faces in the simulation, family trees, graphs of personal and country statistics, integrated Google Maps and Flickr photos, and more in a user friendly interface. (<http://www.educationalsimulations.com/products.html>)
- 3) **PhET** provides fun, interactive, research-based simulations of physical phenomena for free. To help students visually comprehend concepts, PhET simulations animate what is invisible to the eye through the use of graphics and intuitive controls such as click-and-drag manipulation, sliders and radio buttons. In order to further encourage quantitative exploration, the simulations also offer measurement instruments including rulers, stop-watches, voltmeters and thermometers. As the user manipulates these interactive tools, responses are immediately animated thus effectively illustrating cause-and-effect relationships as well as multiple linked representations (motion of the objects, graphs, and the underlying science, deepening their understanding and appreciation of the physical world. (<http://phet.colorado.edu>)
- 4) The University of Florida, Department of Anesthesiology has a **Human Patient Simulator** (HPS) technology that has revolutionized the education and training of clinicians worldwide. It also has Virtual Anesthesia Machine which is used for training purposes. <http://vam.anest.ufl.edu/simulations/simulationportfolio.php>
- 5) **SimTeacher.com** is an online simulation platform for teacher education. Pre-service teachers may become “SimTeachers” in a virtual school, applying concepts they are learning in their college courses to teaching scenarios in a simulated environment. The virtual schools contain fictional yet interactive characters that add life to the scenarios and personalize the scenario-based learning experience for learners. SimTeachers may perform routine activities, like creating lessons plans, taking attendance or completing an Individualized Educational Plan (IEP). (<http://www.simteacher.com>).
- 6) **Google Earth Flight Simulator**: Google Earth Flight Simulator requires Google Earth 4.2 and above to be downloaded into your computer for use. You can choose to fly one of two planes. The F16 is almost impossible to control for novices, so the SR22 propeller plane is the way to go (and offers better sightseeing). You can choose to start from your current position on Google Earth or you can choose from several airports around the world, including the Kathmandu one. (<http://www.sajaforum.org/2007/09/web-google-eart.html>)

18.3.2 Virtual Laboratories

A virtual laboratory is simply a laboratory experience without the actual laboratory. Physical distances, costly equipment and limited expertise often put constraints on performing experiments. However, it is possible to develop web enabled experiments for remote operation. The virtual labs generally comprise a user-friendly graphical interface, working in synchronization with a back-end, consisting of a simulation-engine running on a server or actual measurement data or a remotely triggered experiment. The central activity in any lab is running experiments and collecting data. For this to succeed, a real virtual lab must include real experiments from which students can collect data that are not predefined in any way.

A virtual lab could simply be a set of simulations put together in the form of Java applets, flash-based demos or interactive animations where student could manipulate various parameters of the simulation and observe the results. The other option could be a virtual lab space where users can create their own experiments by arranging objects/ equipment, or remotely connect them together, modify their properties and observe and collect data.

- 1) The **iLab project at MIT** provides an open portal to selected remote laboratories at MIT. Through this portal, students, educators, and self learners are given unrestricted access to some of the MIT iLabs. The vision is to create a worldwide network of shared laboratory instruments and educational materials. It is dedicated to the proposition that online laboratories (real laboratories accessed through the Internet) can enrich science and engineering education by greatly expanding the range of experiments that students are exposed to in the course of their education. <http://openilabs.mit.edu/>
- 2) **The ChemCollective virtual lab.** A Java applet based lab that allows students to design and carry out their own experiments. It is a National Science Foundation funded project, organized by a group of faculty and staff at Carnegie Mellon University for college and high school teachers who are interested in using, assessing, and/or creating engaging online activities for chemistry education. ChemCollective "Virtual Lab," allows students to design and carry out their own experiments while experiencing representations of chemistry that go beyond what is possible in a physical laboratory. (www.chemcollective.org).
- 3) **Cogs.** NASA's virtual lab, Connecting a Generation to Science (cogs) is a place for integrating virtual lab to classrooms and provide downloads to access a variety of advanced microscopes and specimens. The Virtual Lab is a suite of microscopes and multi-dimensional, high-resolution image datasets. It is freely available to teachers, and students. The virtual lab includes:
 - The Fluorescence (Light) Microscope (LM)
 - Scanning Electron Microscopy (SEM)
 - Atomic Force Microscope (AFM)
 - Energy Dispersive Spectrometer (EDS)

The virtual lab software allows you to access, select, and download from a range of specimens requested by science teachers. There are also tools that allow you and your students to annotate, measure and save images. The virtual lab can be used on computers without the purchase of any additional equipment or access to the Internet. (http://www.nasa-inspired.org/cogs/Cogs_learn.htm)

- 4) **Rice Virtual Lab in Statistics** is an excellent place to learn statistics that uses interactive multimedia, simulations and case study to learn statistics. See <http://onlinestatbook.com/rvls.html>
- 5) **Virtual Lab at Stanford University**: Started in 1998, the virtual lab media library at Stanford University has a many programs for student learning in areas related to Physiology, Biology, Immunology, Brain, Health education, etc. See <http://virtuallabs.stanford.edu/>

Check Your Progress 18.1

Notes: a) Write your answers in the space given below.

b) Compare your answers with those given at the end of this unit.

- 1) Define virtual reality.

.....

.....

.....

.....

- 2) Give at least three uses of simulation in education.

.....

.....

.....

.....

18.4 WEB CONFERENCING

Internet facilitates real time communication through number of conferencing tools. Conferencing can be in various forms viz., audio/video conferencing, web based chats, bulletin board systems, shared white boards, etc. Conferencing can be in one-to-one, one-to-many (multicast) and many-to-many (multipoint) modes.

Web Conferencing refers to communication and collaboration for remote attendees which combines text, visual and audio for two way interaction. Web conferencing industry evolved from web-based chat and Instant Messenger (IM) software. NetMeeting introduced in late 1990s was first application to offer complete web conferencing solution.

More and more teachers are adopting video conferencing as a method of enhanced communication and instruction. Video conferencing facilitates learning by allowing remote and distant learners to meet regardless of their location.

18.4.1 Chatting

A web chat is a system that allows users to communicate in real time using easily accessible web interfaces. Chat lets you conduct real-time conversations via text, with as many people as you like. It is primarily meant to refer to direct one-on-one chat or text-based group chat (formally also known as synchronous conferencing), using tools such as instant messengers and Internet Relay Chat (IRC).

Instant messaging (IM) is a form of Internet communications that lets you talk in real time to individuals or groups of people. Users create contact lists of friends to chat with and can block people they don't know or don't want to communicate with. Instant messaging differs from traditional e-mail in the sense that communications can be sent and received instantly, in real-time basis.

The typical features of Instant Messengers

Instant messengers generally have the following features:

- 1) One can **set online status indicating** the availability e.g.: "busy", "away" or "available".
- 2) Create **contact list** (referred to as a buddy list) indicating list of contacts with whom direct communication can be opened instantly.
- 3) **Text chat** facility for real-time instant messaging.
- 4) Maintain **chat history log** to store a full record of all text exchanges with other contacts.
- 5) Provides **interoperability with other IM networks** to communicate with multiple IM networks simultaneously. This is available in Google Talk, Windows Live Messenger, Yahoo Messenger and ICQ.
- 6) Organise **group conference** facilitating exchanges among multiple users simultaneously through text chat.
- 7) Support **VoIP** for audio communication.
- 8) Support **Video** for video communication.
- 9) Make **calls to landline and mobile phones** by directly dialing worldwide phone numbers. This is available in Skype and Yahoo Messenger.
- 10) **Share files and images** directly with persons listed as contacts.

A comparative feature list of some of the popular IM applications is given in Table 18.2.

Table 18.2: Instant Messenger Facts

Features	Skype	Google Talk	Windows Live Messenger	Yahoo Messenger	AIM Pro	ICQ
URL/download	http://www.skype.com/	http://www.google.com/talk/	http://get.live.com/messenger/	http://messenger.yahoo.com/	http://aimpro.premiumservices.aol.com/	http://www.icq.com/
Cross-platform	Win, Mac, Linux, Pocket PC	Win	Win, Mac	Win, Mac, Unix	Win	Win
Web-based access	No	Yes	Yes	Yes	No	No
Multi-network	No	Yes	Yes	Yes	No	Yes
VoIP	Yes	Yes	Yes	Yes	Yes	Yes
Video	Yes	Yes	Yes	Yes	Yes	Yes
PSTN	Yes	No	No	No	No	No
SMS Enabled	Yes	No	Yes	Yes	Yes	Yes
File sending	Yes	Yes	Yes	Yes	Yes	Yes
History (text chat recording)	Yes	Yes	Yes	Yes	Yes	Yes
RSS Support	No	No	No	No	No	No
Open-source/Proprietary	Proprietary	Proprietary	Proprietary	Proprietary	Proprietary	Proprietary
Cost	Free	Free	Free	Free	Free	Free

Adapted from: http://www.kolabora.com/news/2006/09/28/instant_messaging_tools_and_technology.htm

18.4.2 Web Telephony

In audio conferencing, voice is digitised and sent through the Internet to the final destination. For this you require a headset with earphones, a microphone and conferencing software. Internet can also be used to make telephone calls around the world at a cost of local connection. This can serve as an audio conferencing tool to make computer to computer and at times computer to telephone calls.

Web or Internet telephony refers to communications services like voice, facsimile, and/or voice-messaging applications sent through the Internet, rather than the public switched telephone network (PSTN). Voice over Internet Protocol (VoIP) is a technology that allows you to make voice calls using a broadband Internet connection instead of a regular phone line. **VoIP** is a general term used for a family of transmission technologies for delivery of voice communications over IP networks. Other terms synonymous used are *IP telephony*, *Internet telephony*, *voice over broadband* (VoBB), *broadband telephony*, and *broadband phone*. **Voice over Internet Protocol** is a method by which analog audio signals are converted into digital data that can be transmitted over the Internet. VoIP can turn a standard Internet connection for making **free phone calls**.

There are three different ways in which VoIP services are in common use today:

- **ATA** — Analog Telephone Adaptor (ATA) is an analog-to-digital converter that takes the analog signal from traditional phone and converts it into digital data for transmission over the Internet.
- **IP Phones** — Specialized phones that use RJ-45 Ethernet connector to connect directly to router and having all the hardware and software necessary right onboard to handle the IP call.
- **Computer-to-computer** – For this type of VoIP what is needed is application software, a microphone, speakers, a sound card and an Internet connection. There are several vendors offering free or very low-cost software that can be used for this purpose. There is usually no charge for computer-to-computer calls, whatever may be the distance other than the monthly ISP fee.

18.4.3 Video Chatting and Web Conferencing

Video conferencing via the net has enormous potential for enhancing communication in all spheres of life – business, governance, education etc. Video conferencing involves broadcasting and receiving of video signals over the Internet in real-time. For video conferencing the basic requirements are: a video camera (webcam is good enough), microphone, speakers or headphones, sound and video cards with associated software and networking components. Networking can occur over fast Ethernet, TCP/IP (the Internet), cable network or via ISDN (Integrated Services Digital Network). Video-conferencing, however, requires high speed connection for acceptable quality of video output. The bandwidth is the main hindering factor for its wide acceptance as a mode of communication for the general public.

Web conferencing applications come with different levels of facilities. The advanced applications generally have the following features:

- Two way Audio and video interaction among participants

- Slide presentations
- Document/file sharing - the ability to “push” content viz. slides, documents, images, etc. to participants.
- Shared desktop with application sharing facility which provides the instructor with the ability to share the computer desktop with participants or to give keyboard/cursor control of a shared desktop to individual students.
- Shared whiteboards with drawing and annotation tools
- Multimedia playback
- Text messaging - public (viewed by all) and private (person to person) text chat
- Online Quizzes
- Polling and survey tools to be used for assessment, voting and feedback collection
- Virtual hand raising
- Breakout rooms - the facility to “move” users (learners) into virtual rooms for small-group discussion or interaction
- Recording, archiving and playback facility of sessions for future use
- Event management (session scheduling)
- User management (role management viz. moderator, presenter or participant or accepting or blocking users for scheduled sessions)
- Content management
- Reporting and tracking

Most of the features listed above are essentially required to conduct virtual classes in an effective manner. However, all applications may not have all these features. Before procuring or installing any system it is better to assess the requirements and levels of interactivity planned for virtual class delivery.

Web conferencing as a method of communication and instruction is now being adopted by more and more teachers the world over. It enhances learning by facilitating remote or distant learners to meet in virtual space regardless of their location. It can be used in a variety of areas for educational purposes. The most obvious usage is teaching online. It has the ability to gather students to a virtual classroom; speak to them directly; and interact using text, audio and video. It provides a learning experience comparable to a live classroom. Web Conferencing from educational perspective can serve various purposes:

- Imparting distance learning
- Counseling, mentoring or technical help sessions
- Project-based work – project presentation and conducting viva voce
- Faculty and staff collaboration
- Provide access to experts in the field
- Connecting learners with prospective employers

Before adopting any web conferencing facility for imparting education certain issues will have to be dealt with and decisions to be taken for effective utilization of the facility. These are:

- 1) Connectivity – it is important to remember that all learners may not have access to high speed connection. It is therefore, imperative that the application is set in a way that it is accessible to all.

- 2) Cross platform delivery – the application must be compatible with all types of operating system and all browsers. There can be problems with pop-up blockers, firewalls, cookie settings, etc. for which proper guidance and technical support must be provided.
- 3) Client set up – the application must be user friendly requiring minimum intervention on user part to join live sessions. Prior check on client side configuration and online technical support for diagnosing possible technical glitches before session commences is essential for smooth conduct of virtual sessions.
- 4) Audio/ video quality – differences in microphones, webcams, sound cards, Internet connections, etc. can affect the quality of conference and hence must be tested before hand.
- 5) Possible abuse of the platform must be avoided with a clear policy on what kind of usage rights are to be given to the moderators, presenters and participants.

18.4.4 Web Conference Tools

All web conferencing tools work in the same way. The person initiating the conference sets up a new meeting in the tool and then invites participants to join by sending them an email containing the meeting's time, date, password, URL and login instructions. Some conferencing tools may ask for installing a small software in the user computer to participate, though many are entirely web-based requiring only an Internet connection. There are many web-conferencing tools, and you must decide which one to be used in your teaching-learning situation. We shall discuss some issues that you may consider while deciding on the right web-conferencing tool for your organization.

Installation and Setup: As mentioned above, some web-conferencing tools require installation of a software or browser plug in. This should be easy and simple, so that the user does not require technical help. But, a system that is completely web-based is preferred more.

Screen sharing: This is a collaborative feature to share resources in one computer with other users in the group.

Multiple presenters: Usually in one synchronous session, more than one presenter is needed to complete it, as expertise may be available in different individuals. The web-conference tool should have such a facility to enable team presentation.

Whiteboard: A collaborative whiteboard is a useful tool to organize virtual brainstorming and collate ideas synchronously. Such whiteboards normally also include drawing tools to illustrate a point using real-time drawing facility.

Annotation tool: During the presentation, participants need to capture ideas for future use. Use of annotation tools such as notes, pen and pencil with erasing facility help learners to record discussion and personalize learning.

Text-chat: This is like instant messaging. It can be used for conference chat and also for private chat. In virtual class, this is a very useful tool to ask question to the teacher and seek clarification. The use of private text chat facility helps to give individualized feedback that is not known to all the learners. Such a facility helps reduce embarrassment to adult learners, when they actually commit mistakes.

Videoconference: This is the most important feature of a web conference tool. It allows the participants to use a webcam and headphone to broadcast video and voice to other participants in the group/session. Multiple users can use such a facility in a system. However, its use by multiple users simultaneously is dependent on the bandwidth available to the users.

File formats and sharing: For presentation, we need some documents to be shared. These documents can be in different file formats, and the system should be compatible. Usually most web-conference systems allow PowerPoint file of different versions to be shared. Beside this, it is also important to have file sharing for download by the participants.

Recording: A virtual class should be available for later use by students who could not participate in synchronous session due to various reasons. The web conference system should have a facility to record and make available the sessions for asynchronous use.

Price: The cost of a web conference system is probably as important as its features. While there are many Open Source applications such as DimDim, OpenMeeting, etc., are available, most institutions use proprietary tools for web conference for ease and support available. However, if you have technical competence available in your institution, an open source system would reduce your costs considerably. There are different types of cost mechanisms that are negotiable with the vendors for using web conference systems. Some of these are: Hosting - pay per use, hosting – annual, perpetual (hosting by the user organization). We suggest you to negotiate with the vendor for a specific costing for your institutional use.

Table 18.3 gives a comparison of features of some of the popular web conference tools.

Table 18.3: Web conference Tools: A Comparison

APPLICATION	Adobe Acrobat ConnectPro	DimDim	Cisco WebEx Meeting	Illuminate Live	Horizon Wimba
Website	http://www.adobe.com/products/acrobat/connectpro	http://www.dimdim.com	http://www.webex.co.in	http://www.illuminate.com/	http://www.wimba.com/
Software Required	No downloads, supports instant web conferencing for any Windows, Mac, or Linux operating system.	No downloads, supports instant web conferencing for any Windows, Mac, or Linux operating system.	No downloads for participants, will run on any internet server or smart phone mobile device.	Supports Windows, Mac and Linux operating systems, requires Java download	Supports Windows and Mac operating systems, requires Java download
Screen Sharing	Desktop and Applications	Desktop and Applications	Desktop and Applications	Desktop and Applications	Desktop and Applications
Multiple Presenters	Yes	Yes - Max of 4	Yes	Yes	Yes
Annotating Tools	Yes	Yes	Yes	Yes	Yes
Whiteboard	Yes	Yes	Yes	Yes	Yes
Text Chat	Yes	Yes	Yes	Yes	Yes
VoIP	Yes	Yes	Yes	Yes	Yes
Videoconferencing	Yes	Yes	Yes	Yes	Yes
Recording	Yes	Yes with Pro	Yes	Yes	Yes
Polling and Survey	Yes	Yes with Pro	Yes	Yes	Yes
Post-Meeting Reports	Yes	Yes with Pro	Yes	Yes	Yes
Open Source/ Proprietary	Proprietary	Open Source; hosting option with subscription available	Proprietary	Proprietary	Proprietary

Check Your Progress 18.2

Notes: a) Write your answers in the space given below.

b) Compare your answers with those given at the end of this unit.

- 1) Write a short note on the common features of Instant Messaging software.

.....

.....

.....

.....

.....

- 2) What are the three different ways in which VoIP services are used?.

.....

.....

.....

.....

.....

- 3) What are the main features of a web-conference tool?

.....

.....

.....

.....

.....

18.5 IMMERSIVE LEARNING

Immersive learning refers to an online educational experience which is highly interactive in which the learner is engaged with the content to facilitate the learning. Immersive learning includes the games, online simulations and virtual learning worlds. Immersive experiences extend learning beyond the classroom. It includes the use of virtual worlds and educational games, simulations, role plays, and virtual environments, technologies and activities that support collaboration and enable the learner to be immersed in their learning experience. Immersive learning is not restricted to virtual worlds and may include offline as well as online components and a mixed range of technologies and user experiences.

In immersive virtual environment (IVE) user is perceptually surrounded by his or her sense of presence or actually being within it. People interact with a VE by using any of the perceptual channels, viz. visual (by wearing a head-mounted display or sitting in a projection room eg. caves that project visual display in VE), auditory (e.g., by wearing earphones that help localize sound in VEs), haptic (wearing gloves or other hand held devices that use mechanical feedback on contact with objects), or olfactory (by wearing a nosepiece or collar that releases different smells on approaching different objects in VEs).

Immersive learning is an intense learning and developmental activity that requires a student to progress well beyond merely learning to realize the intention and goal of education. The immersive learning experience is designed to bridge content knowledge, skill of application, societal need, and lifelong learning. Use of virtual immersive environment has several advantages for educational use:

- It helps practicing real world skills with rich feedback in a safe environment
- Mastering a technique, behavior or method through guided rehearsals
- Emotionally connecting the learning to the learner
- Embedding the learning in the proper context by providing a simulation of the actual environment
- Ability for geographically dispersed learners to meet together in a virtual environment

The future of online learning will include IVEs as part of the learning toolkit and has immense potential of enriching the distance learning experience. In the following sections we will be discussing the immersive learning applications viz. Digital games and virtual worlds.

18.5.1 Digital Games

Digital games are defined as “applications using the characteristics of video and computer games to create engaging and immersive learning experiences for delivering specified learning goals, outcomes and experiences” (de Freitas, 2007, p.9). In order to understand digital games better, let us define related terminologies: play, games, computer games and video games.

One of the early proponents of digital games in education is M. Prensky, who defined *play* as something a person chooses to do as a source of pleasure that is intensely and utterly absorbing and promotes the formation of social groupings (Prensky, 2001). Play has a fun perspective, though it is also engaging and helps us to learn. According to Prensky (2001), a *game* is recognized and organized play that gives us enjoyment and pleasure. *Computer games* are characterized by six elements: rules, challenge, goals and objectives, interaction, outcomes and feedback, and story or representation. Video games and computer games are used synonymously, and now-a-days, the term digital games is becoming more popular. Whitton (2010) says, digital game should be defined on the basis of its key characteristics, and it may also be noted that all games will not exhibit all the characteristics. Table 18.4 shows ten characteristics with their explanations.

Table 18.4: Defining characteristics of Games

Characteristics	Explanations
Competition	The goal is to achieve an outcomes that is superior to others.
Challenge	Tasks require efforts and are non-trivial.
Exploration	There is a context-sensitive environment that can be investigated.
Fantasy	Existence of a make-believe environment, characters or narrative.
Goals	There are explicit aims and objectives.
Interaction	An action will change the state of play and generate feedback.
Outcomes	There are measurable results from game play (e.g. scoring)
People	Other individuals take part.
Rules	The activity is bounded by artificial constraints.
Safety	The activity has no consequences in the real world.

Source: Whitton (2010).

Digital games can be categorized into three generations (Egenfeldt-Nielsen, 2005):

- **Generation 1:** It has an edutainment perspective with control, inputs, and direct learning as in behaviorism. The tasks are very repetitive and give opportunity to practice certain skills.
- **Generation 2:** It has a cognitive approach, and learner is at the centre of attention. The information is presented in such a way that is appropriate to specific learner. Second generation games use scaffolding, chunking etc. for presentation of information.
- **Generation 3:** The third generation games focus on the use of computer games for education in a meaningful, social situation that facilitated asking the right question and going to the right places for response.

While it is difficult to categorize digital games in the above three generations, as many games fall in more than one group, Gros (2007) lists the following broad genres available:

- **Action Games:** These are reaction based; most of the games are action games.
- **Adventure Games:** The player solves a number of tests in order to progress a virtual world.
- **Fighting Games:** These games involve fighting against computer-controlled characters or those controlled by other people.
- **Role-playing Games:** Human players assume the characters of some person or creature.
- **Simulation:** The player has to succeed within some simplified recreation of a place or situation to achieve a particular goal.
- **Sports Games:** These games are based on sports.
- **Strategy Games:** These games re-create a historical or fictional situation to allow a player to devise an appropriate strategy to achieve a goal.

There are different types of hardware associated with digital games (Mitchell & Savill-Smith, 2004):

- Game machines located in amusement arcades
- Specialized games 'consoles' (powerful computers with high specification graphics capability for use in home, e.g. the Sony PlayStation 2, Microsoft Xbox and Nintendo GameCube)
- Personal computers
- Handheld devices, such as the Nintendo Game Boy, Nintendo DS, PlayStation Portable (PSP), palmtop computers
- Mobile phones
- Other specialized applications (such as airline seats, wristwatches, etc.)

Digital games provide a learning environment that engages the learner, and help them acquire knowledge. They help the learners to adapt to the culture of the information society, which is likely to have long term consequences. It can improve spatial skills and visual literacy of the learner. The digital games have certain inherent characteristics that help the learners to be engaged. Prensky (2001) identified 12 such characteristics, and Table 18.5 gives how these contribute to learners' engagement. For example, the 'winning' characteristics satisfies 'ego gratification'; 'interaction' leads to 'social group' formation etc.

Table 18.5: Game Characteristics and Engagement

Characteristics	Contribution to engagement
Fun	Enjoyment and pleasure
Play	Intense and passionate involvement
Rules	Structure
Goals	Motivation
Interactive	Doing the activity
Outcomes and feedback	Learning
Adaptive	Flow
Winning	Ego gratification
Conflict/Competition/Challenge	Adrenaline
Problem solving	Sparks creativity
Interaction	Social groups
Story or representation	Emotion

(**Source:** Attewell and Savill-Smith, 2003).

Digital games highlight the eight learning principles given by Oblinger (2004):

- **Active learning:** As the games require the player to interact and progress, the learners are engaged in active learning. Often the rules of a game are built to help mastery learning and skill development through active and repetitive participation.
- **Assessment:** Active gamers can assess their progress within a game and can reflect on skills they require further to achieve the goals. As most games provide score, they can compare their achievement and progress.
- **Feedback:** Being interactive, the games provide immediate feedback, and convey the consequences of correct or incorrect choices. This feature enables the learner/player to learn from their successes and mistakes.
- **Individualization:** Games are designed to help the learner to be immersed through individualized approach of setting names/ persona and levels of complexity.
- **Motivation:** When the tasks in a game are meaningful, and rewarding, the learner becomes motivated. This leads to more time spent by the learners on the game to achieve goals.
- **Scaffolding:** The levels provided in the games provide a gradual increase in complexity, knowledge and skill requirements. At each level, agents may provide relevant, just-in-time support to the learners to gradually progress in a step-by-step manner.
- **Social:** As some of the games can be played in multiplayer mode, they can grow into large communities.
- **Transfer:** Knowledge and skill transfer are the biggest challenges in education. Use of digital games that are realistic and give simulated representation of the real world help transfer better.

18.5.2 Virtual Worlds

"A virtual world is an internet-based, simulated environment where users interact via motionable avatars, graphical images that represent people" (Antonacci et al. 2008). Use of virtual world can foster collaborative learning, and give opportunity to carry out tasks that could be difficult in the real world. Since the virtual words are 3-D environments, they can be used in a variety of ways:

- Discovery learning by clicking on objects
- Reinforcement of learning by offering a repository of learning aids and tools
- Collaborative workspaces, encouraging informal discussions
- Traditional instructor-led learning at a distance
- Simulated learning by modeling a process or interaction that closely resembles the real world

The virtual worlds are platforms enabled by multi-user three dimensional (3D) software environments to provide an effect of real world scenario. Most discussions on virtual worlds today focus on Second Life (see <http://secondlife.com>). However, there are other virtual worlds such as Kaneva (see <http://www.kaneva.com/>), Twinity (see <http://www.twinity.com/en>), The Palace (see <http://www.thepalace.com/>), etc. These virtual world environments provide broadly four characteristics (Robbins-Bell, 2008):

- *Persistence*: A virtual world can't be paused; it exists whether or not a user is logged in.
- *Multiuser*: A virtual world must be populated or at least have the potential for population.
- *Avatars*: Rather than offering an icon to represent a user, a virtual world allows a user to create an agent that takes action, an avatar that can perform action on the request of the user.
- *Wide Area Network*: A virtual world is facilitated via a wide area network rather than a local machine or a network of workplace.

Virtual worlds show potential and promise for improving teaching and learning by motivating and stimulating the learners through engagement and immersion in the learning event/process. So, it is believed that virtual worlds can be used as a constructivist approach (Coffman and Klinger, 2007). The virtual world environment such as Second Life (SL) provides opportunities for both the student and the teacher to create and manipulate objects in the virtual environment leading to a dynamic and rich learning environment. Subjects like History to Marine Science could be taught using virtual world that would have 'real effect' of teaching in the past or going down the sea. In the learning process, the individual students through their personalized avatars should also be engaged in discussion, debate, designing and decision-making as in a real world. Robbins and Butler (2009) present a pedagogical model for choice of virtual world as a learning platform. They present taxonomy of virtual worlds (first person simulations, gaming world, emergent worlds such as the SL, and task worlds). They further go on to use teaching (objectivist - constructivist) and learning (declarative knowledge – procedural skills) as two dimensions and suggest that use of virtual world in education should be based on clear purpose and adequate planning.

Using Virtual Worlds

To start with you can create a free account in the website of SL. This asks you to create a name for your avatar, and see how you would look like in the virtual world. Though this gives you limited options, it is quite interesting to see oneself in a disguised way! Once you complete the required processes, including the email authentication, you need to download the desktop application and run it in your computer. The minimum system requirements to run the application in Windows are: XP or Vista Operating System, 800 MHz Pentium III or Athlon, or better, 512 MB RAM, 1024X768 pixel screen resolution, On board Graphics Card with NVIDIA GeForce 6600 or better, and Cable or DSL Internet connection. It is better that you have higher

recommended system requirements to run the application without problem, as the heavy multimedia environment requires more RAM and high speed broadband connection. This is surely a limitation for the developing countries to make full usage of the virtual worlds. The SL provides you with orientation to use the system effectively, and then you can use the teleport facility to go to a specific address by using the secondlife universal resource locator (slurl).

As a teacher what you can do is limited by your imagination. Here follows some tips:

- You can use existing virtual worlds (as activity) to design teaching-learning around it. So, you direct your students to a specific slurl and allow them to discover, interact, discuss and prepare reports.
- Create simulation for role-play such as in a business environment.
- Provide virtual experience of space, sea and historical events through existing resources or create your own applications.
- Teach interpersonal communication, team spirit and other soft skills.
- Provide internship opportunities in virtual world.

In whatever way you use virtual worlds, do not forget to provide initial orientation to the learners about the technology, avatars, user interfaces, keyboard short-cuts, etc. (Calongne, 2008). Some time spent on these activities help students to feel not only comfortable about the technology, but also develop social skills required for learning. Based on review of virtual worlds, de Freitas (2008) presents a set of attributes and related questions to be asked while using virtual world. It is presented in Table-18.6 for your reference and use.

Table-18.6: Considering the attributes of virtual worlds for usage

Attributes	Description	Questions for consideration
Learner control	Learner/user control and interactivity through the creation of an avatar.	Would the learner require engagement? Would interactivity help to engage the learner or learner group?
Collaboration	Emphasis upon collaboration and community building.	Are the learning outcomes facilitated through collaborative rather than independent learning approaches? Are the learning outcomes supported through community building and ongoing support?
Persistence	Persistence of the world has led to the capacity for immediacy and synchronous use of the world has appeal.	Would the group require support beyond the seminar face-to-face contact times? Are the learners distributed across a wide geographical area?
Requirement for 3D interactions and experiences	While the user interface is often 3D, this is not always the case. Some social worlds, particularly social worlds for children, are animated and 2D, and some mash-up applications of mirror worlds are distinctly non-3D but rely upon a layering of data and data sets.	Would the learners learn more effectively in a closer to real situation? Are there scenarios of practice that could be role played in virtual worlds? Would experience-based learning benefit the learner group? Could social software and games be integrated into the experience?
Inclusion of sharable and user generated digital content	Most of the virtual worlds have included digital interactive content, be it games (which are particularly popular) or content generated by users to share with others.	Would the learners benefit from a multimodal approach which would use visual and social software tools? Are the learners engaged and motivated by making their own content and sharing it with others?
Immersion and interactivity	Immersion and interactivity are the additional characteristics to include in any list of requirements for a serious virtual world; the user must feel immersed in the environment and fully engaged in the activities being undertaken. This is normally achieved through the representation of the user and environment in-world.	How immersive does the learning experience need to be to convey the learning outcomes? What level of detail is required? Does the learner perform better with more control over what they are attempting?

(Source: de Freitas, 2008).

Some examples of virtual worlds are:

- Active Worlds: <http://www.activeworlds.com/>
- Cyber Town: http://www.cybertown.com/main_iframes.html
- NASA World Wind: <http://worldwind.arc.nasa.gov/>
- Media Grid: Immersive Education: <http://immersivededucation.org/>
- Qwaq Forum: <http://www.qwaq.com/>

Check Your Progress 18.3

Notes: a) Write your answers in the space given below.

b) Compare your answers with those given at the end of this unit.

1) List the defining characteristics of digital games.

.....

.....

.....

.....

.....

2) List at least four genre of digital games.

.....

.....

.....

.....

.....

3) What are the characteristics of virtual worlds?

.....

.....

.....

.....

.....

18.6 LET US SUM UP

In this unit, we discussed the potentials of virtual reality in education, and described the use of simulations, virtual laboratories, virtual worlds, and digital games. We also discussed about the virtual class related technologies such as the Instant Messaging for chatting and web conference tools for conduct of virtual meetings and virtual class. We have given large number of examples in this unit to help you further explore the world of virtual reality. The use of instant messaging has become a common activity in day to day life with the use of GoogleTalk and a number of other messengers, including Skype. While the web conference tools such as Adobe Connect Pro and other proprietary software are quite effective, and need sophisticated server to host, there are also hosting options available with many vendors, which provide trial versions. We identified the criteria to look for while deciding the right web conference tool for your organization. In the end we discussed

the concept on immersive learning that is provided by the digital games and virtual worlds. There are different types of games, and because of their inherent characteristics, these are truly engaging. However, it may be noted that not all characteristics of digital game are present in all the games available in the market. The emergence of SecondLife and many other platforms of virtual world have given a lot of scope for teachers to design and use virtual reality for developing technical skills as well as social skills.

18.7 KEYWORDS

Avatar is a computer user's representation of himself/herself or alter ego in the form of a three-dimensional model used in computer games.

Digital games are applications using the characteristics of video and computer games to create engaging and immersive learning experiences for delivering specified learning goals, outcomes and experiences.

Simulation is the imitation of some real thing, state of affairs, or process.

Virtual reality: is an artificial environment that is created with software and presented to the user in such a way that the user accepts it as a real environment.

Virtual world is an internet-based, simulated environment where users interact via motionable avatars, graphical images that represent people

18.8 REFERENCES AND FURTHER READINGS

- Aldrich, C. (2004). Clark Aldrich's Six Criteria of an Educational Simulation, Available at <http://www.e-learningguru.com/wpapers/sixcriteria.pdf> (accessed on 17th July 2010)
- Antonacci, D., DiBartolo, S., Edwards, N., Fritch, K., McMullen, B., & Murch-Shafer, R. (2008). The Power of Virtual Worlds in Education, ANGEL Learning White Paper, July 2008. Retrieved on 07/09/2009 from the WWW at http://www.angellearning.com/products/secondlife/downloads/The%20Power%20of%20Virtual%20Worlds%20in%20Education_0708.pdf
- Attewell, J., & Savill-Smith, C. (2003). Mobile learning and social inclusion – focussing on learners and learning. Paper presented to the MLEARN 2003 Conference – *Learning with Mobile Devices*, 19–20 May 2003, London.
- Calongne, C.M. (2008). Educational Frontiers: Learning in a Virtual World, *Educause Review*, 43 (5), 36-48.
- Coffman, T., & Klinger, M.B. (2007). Utilizing Virtual Worlds in Education: The Implications for Practice, *International Journal of Social Sciences*, 2 (1), 29-33.
- de Freitas, S.I. (2006). Using games and simulations for supporting learning, *Learning, Media and Technology*, 31 (4), 343-58.
- de Freitas, S.I. (2007). *Learning in Immersive Worlds: A Review of Game-based Learning*, Briston: JISC
- de Frietas, S. I. (2008). Serious Virtual Worlds: A Scoping Study. JISC Report. Retrieved on 07/09/2009 from the WWW at <http://www.jisc.ac.uk/media/documents/publications/seriousvirtualworldsv1.pdf>
- Douch, R., Attewell, J., & Dwason, D. (2010). *Games technologies for learning: More than just toys*, London: LSN.
- Egenfeldt-Nielsen, S. (2005). *Beyond edutainment*. Unpublished dissertation, University of Copenhagen. Copenhagen, Denmark (cited in Gros, 2007)
- Fällman, Daniel, Backman, Anders, Holmlund, Kenneth (1999). VR in Education: An Introduction to Multi-sensory Constructivist Learning Environments, Available at http://daniel.fallman.org/resources/papers/Fallman_VRIE.pdf
- Grady, S. M. (2003). *Virtual reality: Simulating and enhancing the world with computers*. New York: Facts on file.
- Gros, B. (2007). Digital games in education: The design of games-based learning environments, *Journal of Research on Technology in Education*, 40 (1), 23-38.

- Keller, Harry E. and Keller, Edward E. (2005). Making Real Virtual Labs, *The Science Education Review*, 4(1), Available at http://www.scienceeducationreview.com/open_access/keller-labs.pdf
- Kincaid, J. Peter & Westerlund, Ken K. (2009). Simulation in education and training, in M. D. Rossetti, R. R. Hill, B. Johansson, A. Dunkin and R. G. Ingalls, eds. *Proceedings of the 2009 Winter Simulation Conference*, Available at <http://www.informs-sim.org/wsc09papers/024.pdf> (accessed on 19th July 2010)
- Lunce, Les M., (2004). Computer Simulations in Distance Education, *International Journal of Instructional Technology and Distance Learning*, 1(10) Available at http://itdl.org/journal/oct_04/article02.htm (accessed on 17th July 2010)
- Mitchell, A., & Savill-Smith, C. (2004). *The use of computer and video games for learning: A review of the literature*, London: Learning and Skills Development Agency
- Oblinger D.G. (2004). The next generation of educational engagement. *Journal of Interactive Media in Education* (8). Special issue on the Educational Semantic Web. Available at <http://www-jime.open.ac.uk/2004/8/oblinger-2004-8-disc-paper.html> (accessed on July 19, 2010)
- Prensky, M. (2001). *Digital Game-Based learning*, New York: McGraw Hill.
- Robbins, R.W, & Butler, B.S. (2009). Selecting a Virtual World Platform for Learning, *Journal of Information Systems Education*, 20 (2), 199-210.
- Robbins-Bell, S. (2008). Higher Education as Virtual Conversation, *Educause Review*, 43 (5), 24-34.
- Shi, S. & B. Morrow. (2006). E-Conferencing for Instruction: What Works? *Educause Quarterly*, 29 (4), p. 42-49. <http://www.educause.edu/ir/library/pdf/eqm0646.pdf>
- Warburton, S. & Perez-Garcia, M. (2009). 3D design and collaboration in massively multi-user virtual environments. In D. Russel (Ed.), *Cases on collaboration in virtual learning environments: processes and interactions*. Hershey, PA: IGI Global.
- Warburton, Steven (2009) Second Life in higher education: Assessing the potential for and the barriers to deploying virtual worlds in learning and teaching, *British Journal of Educational Technology*, 40 (3), 414-26.
- Whitton, N. (2010). *Learning with Digital Games*, New York: Routledge

18.9 FEEDBACK TO CHECK YOUR PROGRESS QUESTIONS

Check Your Progress 18.1

- 1) It is an environment created with a combination of high speed computer, advanced programming techniques, and interactive haptic devices to give the user a feeling of a real world in effect.
- 2) Simulations are structures by authentic rules. Your response may include any of the following:
 - It can be as simple as interactive spreadsheet for income tax calculation.
 - It can be used for modeling system before actual design.
 - It can help take decision by considering multiple factors, as in the game SimCity.
 - Teach high risk skills such as aviation and sophisticated medial surgery.
 - Teach space science and technology.
 - Create science labs.

Check Your Progress 18.2

- 1) Common features of Instant Messaging software, such as MSN, YahooMessenger, Skype, GoogleTalk, etc. are:
 - Online status showing busy, available, away
 - Contact list
 - Text chat

- Chat history
 - Group conference
 - VoIP
 - Video communication
 - Calls to alndline and mobile phones
 - File sharing, etc.
- 2) Three ways to VoIP use are: use of analog to digital converter, specialized IP phones, and software enabled applications.
 - 3) Main features of a web-conference tool are:
 - Video conference
 - Whiteboard
 - Screen sharing
 - Multiple presenters
 - Annotation
 - Text chat (public and private)
 - File sharing
 - Session recording

Check Your Progress 18.3

- 1) The defining characteristics of digital games are: competition, challenge, exploration, fantasy, goal, interaction, outcomes, people, rules and safety.
- 2) Your response may include any four of the following:
 - Adventure games
 - Action games
 - Fighting games
 - Sports games
 - Role playing games
 - Simulations
 - Strategy games
- 3) The virtual world environments have the following four characteristics:
 - Persistence – the environment exist whether or not users are online
 - Multiuser – it must be populated with more than one user, or have the potential for the same
 - Avatars – Rather than using icons to represent users, it should have avatar to present themselves
 - Wide Area Network – the virtual words are not desktop applications, and they are available only on the Internet.



UNIT 19 REUSABLE LEARNING OBJECTS

Structure

- 19.0 Introduction
- 19.1 Learning Outcomes
- 19.2 Reusable Learning Objects
 - 19.2.1 Characteristics of Learning Objects
 - 19.2.2 Advantages of Learning Objects
 - 19.2.3 A Critique on Learning Objects
- 19.3 Learning Objects: Metadata Standards and Specifications
 - 19.3.1 Aviation Industry CBT Committee (AICC)
 - 19.3.2 Dublin Core
 - 19.3.3 Instructional Management Specifications (IMS)
 - 19.3.4 IEEE Learning Technology Standard Committee (LTSC)
 - 19.3.5 Sharable Content Object Reference Model (SCORM)
 - 19.3.6 Alliance of Remote Instructional Authoring and Distribution Networks for Europe (ARIADNE)
- 19.4 Structure and Components of Learning Objects
- 19.5 Learning Object Creation Process
- 19.6 Types of Learning Objects
- 19.7 Let Us Sum Up
- 19.8 Keywords
- 19.9 References and Further Readings
- 19.10 Feedback to Check Your Progress Questions

19.0 INTRODUCTION

After affecting sweeping changes in the way people communicate and do business, the Internet is bringing about a paradigm shift in the way people learn. Consequently, a major change is also happening in the way educational materials are designed, developed, and delivered. Many of these developments, including Web2.0 technologies have been discussed in Unit 17 of this block. Two more important aspects are yet to be discussed and these are learning objects and learner management systems. Learning object is more to do with designing and production of learning content whereas as learner management system is to do with how this content is delivered to the learner and the management of learner and the learning process. We will focus on learning object in this unit and learner management system in the next unit.

Reusable Learning objects (RLOs) enable and facilitate the use of educational content online. Internationally accepted specifications and standards make them interoperable and reusable by different applications and in diverse learning environments. This unit will look in to the nature of this emerging technological construct and will help you get to know reusable learning objects (RLOs) and the related concepts and issues. This unit introduces many of the concepts involved: standards, reusability, applications, and so on. The knowledge that we will build on throughout this unit will form a foundation for you to create your own plan for developing and delivering e-learning based on RLO.

In this unit, we would address the following questions:

- What are learning objects and reusable learning objects?

- What are the characteristics of reusable learning object which makes it distinct from other learning content?
- How to catalogue and make the RLO accessible to the users?
- What is the structure of learning objects and how to develop one?
- What are the benefits of learning object and are there any demerits?
- What are the delivery options?
- What are the standards of learning objects and who makes them?

19.1 LEARNING OUTCOMES

After going through this unit, you are expected to be able to:

- *Define* ‘learning objects’ including Reusable Learning Objects (RLO);
- *Describe* the history of learning object movement;
- *Describe* the characteristics of learning objects;
- *Discuss* the use of learning objects and their cataloguing;
- *Describe* packaging and publishing learning objects (including SCORM); and
- *Describe* the advantages and disadvantages of learning object strategy.

19.2 REUSABLE LEARNING OBJECTS

The term learning object means many things to many people and there are many definitions. The concept of learning object is still emerging and it is worthwhile to look into many of these definitions to get better understanding of what people mean when they refer to learning object.

According to the Learning Technology Standards Committee (LTSC) of the Institute of Electrical and Electronics Engineers (IEEE), “A learning object is any entity, digital or non-digital, which can be used, re-used or referenced during technology supported learning. Examples of technology-supported learning include computer-based training systems, interactive learning environments, intelligent computer-aided instruction systems, distance learning systems, and collaborative learning environments.”

In its white paper titled “Reusable Learning Object Strategy,” Cisco Systems, Inc., defined a two-level hierarchy of objects in which five types of reusable information objects — concept, fact, principle, process, and procedure — are used to build a larger structure based on a single terminal objective, called the *reusable learning object*.

According to Cisco’s white paper, titled “*Cisco Systems Reusable Information Object Strategy*,” a learning object is based on a single learning or performance objective, built from a collection of static or interactive content and instructional practice activities. Any learning object can be “tested” through assessments that measure the learning or performance objective and are either positioned with the learning object or collected as an assessment group. Within the learning object, content, practice, and assessment groupings are built from raw media assets such as text, audio, animation, video, Java code, applets, Flash, and any other asset needed for the given delivery environment. Finally, everything found in the learning object is identified with metadata so that it can be referenced and searched both by authors and learners.

New Media Consortium (NMC) as part of its Learning Object Initiative defined learning object as any grouping of materials that is structured in a meaningful way and is tied to an educational objective and according to them the “materials” in a learning object can be documents, pictures, simulations, movies, sounds, and so on. Structuring these in a meaningful way implies that the materials are related and are arranged in a logical order. But without a clear and measurable educational objective, the collection remains just a collection.

University of Wisconsin - Extension: Glossary available at <http://www.uwex.edu/ics/design/glossary.htm#l> defines Learning objects as “small electronic units of educational information that are flexible, reusable, customizable, interoperable, retrievable, facilitate competency-based learning, and increase the value of content.”

The following are the Learning Object’s structural components:

- **Objective:** A statement describing the intended criterion-based result of an instructional activity.
- **Learning Activity:** an element of the instruction that teaches to an objective.
- **Assessment:** an element that determines if an objective has been met

Learning objects are authored in small pieces, assembled into a database, and then delivered to the learner through a variety of delivery media as a lesson or assemblage of lessons grouped in units, modules, courses, programmes or as an independent role play, exercise, case study, labs etc.

To conclude a digital learning object consists of content, metadata and an interface. The content is made up of instructional, practice, and assessment assets, which are the materials or “blocks” that make up the learning object. This may contain images, animations, text passages, videos, audio etc. Metadata refers to a collection of keywords, attributes, and descriptive information that tells authors, learners, and systems about a learning object so that it can be referenced and searched. The interface is the part of the learning object with which the user interacts. It includes the graphic design, navigational elements, and other controls that the user sees.

19.2.1 Characteristics of Learning Objects

Ideally, learning objects should have the following characteristics:

- **Usability** - In order to be defined as a learning object, there must be some intrinsic instructional value. It should result in a complete learning sequence, objective, skill or competency by combining a series of elements including content, media, and interactivity.
- **Adaptability** - Adaptability ensures the learning object is tailored perfectly for the individual and situational needs. They allow for easy customization of courses for a whole organization or even for each individual.
- **Reusability** – A single LO may potentially be used in multiple contexts for multiple purposes. It should allow users to incorporate it into multiple applications without much additional effort. Such LOs can be distributed through learning object repositories in order to share and reuse the object in the future.
- **Contextual Neutrality** - In order to maximize their reusability, learning objects are required to minimize the amount of information specific to a

given context. This would make it portable, reusable, and relevant as an independent learning experience.

- **Interactivity** – With the advancement of technology the learning objects are becoming more and more interactive. Engaging learners, making them active participants in the learning experience, is key to having them meet the learning objective.
- **Traceability** - Every LO has descriptive information allowing it to be easily found by a search. This usually achieved by having metadata which facilitates reuse by others.
- **Independent** - learning objects are discrete and coherent chunks of information, activities or assessment, which are self-contained in that they can contain a complete learning sequence. Each learning object is capable of either standing alone or standing in unison with other learning objects to create any number of courses.
- **Interoperability** - To be reused in multiple delivery media, learning objects should be created free of any particular format and this is usually achieved by following internationally accepted standards.

Check Your Progress 19.1

Notes: a) Write your answers in the space given below.

b) Compare your answers with those given at the end of this unit.

- 1) Define Learning Object in your own words.

.....

.....

.....

.....

.....

- 2) List five characteristics of Learning Objects.

.....

.....

.....

.....

.....

19.2.2 Advantages of Learning Objects

Learning objects have a number of advantages as follows:

- **Financial** - Ensuring that all resources are shared will reduce duplication of effort and encourage reuse by students and educators all over the world. Avoiding re-creating material that already exists is one of the important advantages of RLO
- **Flexibility** – The same learning object can be used in many different ways, in different learning contexts, within different curriculum frameworks and even for completely different learning purposes.
- **Customisation** – Developing new learning objects is very much easier when adapting existing objects. The context around the learning object, and often the learning object itself, can be customised by each user to

suit their needs (eg literacy levels, focus of inquiry, level of expertise in the content, take into account prior learning etc)

- **Future-proofing** – The use of international standards for interoperability ensures freedom from proprietary solutions that tie an organisation to a single vendor.
- **Time Saving** - Time is critical to the quality of teaching. By saving time through using a large pool of learning objects staff can spend more time with students or developing new and exciting learning objects. Overall the student learning experience is enhanced.
- **High quality resources** – Using multimedia in learning objects allows for simulations, animations or use of video and sound to improve the quality of the learning experience offered to students.
- **Access** – Students and teachers can access resources from many different places, at different times and for their own purposes, e.g. for problem-solving, consolidation of a skill etc. LO will load more quickly over the Internet and generally requires less memory.
- **Ease of production** – From LO author's point of the availability of specific templates and software for creating LOs and a consistent design, development process and standards will give more time to focus on actual content and create quality learning objects.
- **Just-in-time learning** – RLO gives the learners what they need just when they need it.
- **Learning Style** – Learners may be able to get the same information in multiple formats, allowing them to choose their preferred method.

Cisco has identified the following benefits of learning objects to authors and learners:

For Authors

For authors, a learning object strategy accomplishes the following:

- Supports the design of many learning approaches, including receptive, directive, guided discovery, and exploratory
- Ensures through the use of object-specific templates, that design and development of learning products are consistent across the organization
- Provides a consistent design structure early in the development process, maximizing resource allocation while minimizing development risks
- Provides guidelines for authors, improving their ability to write effective and efficient performance-based training, assessments, and resources
- Enables detailed searches that allow authors to find, reuse, and repurpose any object or media
- Allows authors to combine old and new objects to build new solutions to meet the needs of their learners
- Supports both reuse and repurposing from the smallest media element up to larger course structures and learning contexts
- Enables application of delivery formats and styles to the learning objects as they are “published” for delivery (also known as single-source development), saving time and resources when authors are developing and maintaining learning products
- Supports a broad range of delivery types, including instructor-led training (ILT), self-paced e-learning training, performance-support tools, virtual classrooms, personal digital assistants (PDAs), or blended delivery solutions

For Learners

For learners, a learning object strategy accomplishes the following:

- Provides a mechanism for learners to self-assess their skills and knowledge in order to receive a prescribed course of action for future learning
- Supports the acquisition of new skills and knowledge through education, experience, or exposure
- Supports multiple delivery types, media types, and presentation styles to fit a learner's needs, preferences, and work environment
- Enables through the use of detailed metadata about each object, custom learning paths to be tailored to the knowledge and skills that individual learners need for their job
- Enables learners to search on job-specific objects and efficiently access the right amount of knowledge as it is needed
- Delivers a consistent learning experience with each deliverable using learning objects, including job aids, classroom training materials, elearning, and blended delivery formats
- Supports multiple learning approaches, ranging from passive, receptive training to discovery and problem-solution based training

19.2.3 A Critique on Learning Objects

Many people have critiqued the entire learning objects way of thinking from a number of perspectives. Friesen (2003), in a well-known paper titled "Three objections to learning objects and e-learning standards," clearly articulates some of the most popular objections. These objections are given in brief below:

Objection 1: What's a learning object, anyway?

The first objection is to do with very definition of learning objects. Many people have defined it in different ways and also there is no consensus regarding its granularity. He further observes that the term "learning object" suggests neither simplicity, compatibility nor any obvious relative advantage over prevailing teaching practice. He concludes his objection by stating "In order for the positive potential of learning objects to be realized, they need to be labelled, described, investigated and understood in ways that make the simplicity, compatibility and advantages claimed for them readily apparent to teachers, trainers and other practitioners" (Friesen, 2003).

Objection 2: Where is the Learning in E-Learning Standards?

Though he agrees upon that the standards in e-learning ensures interoperability, portability and reusability of content what he object is to its simultaneous claims to pedagogical relevance and pedagogical neutrality. In contradistinction to SCORM's (one such standard to be discussed later in this unit) own claims to "pedagogical neutrality," some of the experts have been asserting that SCORM is **limited** in its pedagogical scope, neutrality or relevance. He has concluded his objection by saying "specifications and applications that are truly pedagogically neutral cannot also be pedagogically relevant" (Friesen, 2003).

Objection 3: Education in a Militarized Zone?

His third objection is to the disproportionately large influence of large corporations and the American military on specifications and standards. He feels that the military technical standards and specifications cannot be

considered as solutions to pedagogical problems. Friesen summarizes, “vision of e-learning specifications and systems for military applications is rather far a field from the practices, contexts and values that dominate public (and other forms of) education. The obvious fact is that the goals of public education, however they might be construed, are radically different than those of the American military” (Friesen, 2003).

Other criticisms of learning objects are the following:

- **Learning objects and the context:** Instructional designers work to make learning objects as free from surrounding context as possible in order to increase their potential for reuse; however, in the current pedagogical practices of constructivism the social and other context of learner plays a vital role in learning and understanding. Therefore in the name of reusability the move to decontextualize educational materials is troubling.
- **Copyright:** The burden of clearing copyright for learning objects to be used in the course production process can block the process altogether.
- **Technical Content:** One of the frequent criticisms of RLOs is that they only work with technical content and not suitable for other content areas.
- **Lower order learning:** Another common criticism is that RLOs can only be strung together to form step-by-step directive learning architectures. This is where the learner cannot explore, apply problem-solving skills, or achieve higher cognitive learning objectives such as synthesis and evaluation.
- **Translation:** Online learning objects written in one language will not be easily usable internationally because they have to be translated into other languages

Check Your Progress 19.2

Notes: a) Write your answers in the space given below.

b) Compare your answers with those given at the end of this unit.

1) Describe three advantages of Learning Objects.

.....

.....

.....

.....

.....

2) What are the objections to Learning Objects?

.....

.....

.....

.....

.....

.....

19.3 LEARNING OBJECTS: METADATA STANDARDS AND SPECIFICATIONS

The term metadata refers to a collection of keywords, attributes, and descriptive information that tells authors, learners, and systems about a learning object. It is the information about the learning object itself as opposed to the information in the learning object. “Metadata, literally “data about data,” is descriptive information about a resource. For example, the card catalog in a public library is a collection of metadata. In the case of the card catalog, the metadata are the information stored on the cards about the Author, Title, and Publication Date of the book or resource” (Wiley, 2001).

Similarly street names and house numbers are widely accepted descriptors that make it easier for people to find a particular building. The street names and numbers are a form of metadata. The purpose of metadata is primarily to enable searching and retrieval of learning content. It does this through provision of information about the content (it can be thought of as a virtual index card). The task is to define the structure and format of fields for this card and their range of values (taxonomies) where appropriate.

Why metadata?

- Metadata is useful for search engines and online repositories locate and identify learning objects
- Tracking ownership and attribution information and handling rights management issues
- Communicating with learning management systems (LMS)

The goal of standards is to provide fixed data structures and communication protocols for Learning objects and cross-system workflows. This enables interoperability between application, such as Learning Management System (LMS) or in-house developed content, by providing uniform communication guidelines that can be used throughout the design, development and delivery of Learning Objects. There have been a number of efforts worldwide to develop standards for learning object interoperability. The standards are of because they support- Interoperability, durability, manageability, re-usability, and accessibility. These standards focus on content metadata, content packaging, and run-time communication to support tracking of student activities.

To this end, there are several organizations working toward standards and to make sure learning content is ‘interoperable’ with various learning management technologies. In recent years, groups like the Aviation Industry Computer-Based Training (CBT) Committee (AICC), the IMS Global Learning Consortium, Inc., the Institute of Electrical and Electronics Engineers (IEEE), the Alliance for Remote Instructional Authoring and Distribution Networks for Europe (ARIADNE), the Dublin Core, Sharable Content Object Reference Model (SCORM) and CanCore have developed specifications or guidelines for various aspects of learning object development and use. What follows is a brief discussion on each of these standards.

19.3.1 The Aviation Industry CBT (Computer-Based Training) Committee (AICC)

AICC is an international association of technology-based training professionals. The AICC develops guidelines for aviation industry in the

development, delivery, and evaluation of CBT and related training technologies. The objectives of the AICC are as follows:

- Assist airplane operators in development of guidelines which promote the economic and effective implementation of computer-based training (CBT) media.
- Develop guidelines to enable interoperability.
- Provide an open forum for the discussion of CBT (and other) training technologies.

The AICC promotes interoperability standards that software vendors can use across **multiple** industries so that a vendor can sell their products to a broader market for a lower unit cost. Since AICC recommendations are fairly general to most types of computer based training they are widely used outside of the aviation training industry. Who ever is concerned about reuse and interoperability of online learning, the AICC standards are important to be considered. The AICC also actively coordinates its efforts with broader learning technology standards organizations like IMS, ADL, ISO SC/36, and IEEE/LTSC.

AICC Guidelines & Recommendations (AGR's)

The AICC develops technical guidelines (know as AGR's) and their related specifications. Each AGR makes a technical recommendation in a specific area. The AICC has 11 AGR's (AGR-002 thru AGR-012). AGR-001 is listing of all AICC AGR's and is not considered an actual recommendation. The term "AICC Compliant" means that a training product complies with one or more of the 9 AICC Guidelines & Recommendations (AGR's). The most common meaning of "AICC compliance" (when associated with CBT courseware or CMI systems) is compliance with the AICC documents *AGR-006* (File-based CMI Systems) **or** *AGR-010* (Web-based CMI Systems). These AGRs define the communication between CMI systems and CBT courseware. Some of these AGR are given in the Table 19.1.

Table 19.1: AICC Guidelines & Recommendations (AGRs)

1989	:	Common platform guidelines for CBT delivery (AGR-002).
1992	:	A DOS-based digital audio guideline (AGR-003) before the advent of window multimedia standards. The guideline enabled end-users to use one audio card for multiple vendors' CBT courseware. Due to the huge amount of CBT legacy courseware, this guideline is still in use.
1993	:	A guideline for CMI (LMS) interoperability in 1993. This guideline (AGR-006) resulted in the CMI systems that are able to share data with LAN-based CBT courseware from multiple vendors.
1996	:	A navigation icon guideline (AGR-009) to help standardize the student user controls in CBT.
1998	:	The CMI (LMS) specifications were updated to include web-based CBT (or WBT). This new web-based guideline is called AGR-010.
1999	:	The CMI (LMS) specifications were updated to include a JavaScript API interface. (This is the basis of the SCORM runtime environment).
2005	:	The Package Exchange Notification Services (PENS) guideline (AGR-011) allows Authoring/Content Management system to seamlessly integrate publishing with LMS systems.
2005	:	Training Development Checklist (AGR-012) describes a check list of AICC guidelines to consider before purchasing or developing CBT/WBT content or systems.

19.3.2 Dublin Core

The Dublin Core Metadata Initiative (DCMI) is an open organization, incorporated in Singapore as a public, not-for-profit Company limited, engaged in the development of interoperable online metadata standards that support a broad range of purposes and business models. DCMI's activities include work on architecture and modeling, discussions and collaborative work in DCMI Communities and DCMI Task Groups, annual conferences and workshops, standards liaison, and educational efforts to promote widespread acceptance of metadata standards and practices. (The name "Dublin" is due to its origin at a 1995 invitational workshop in Dublin, Ohio; "core" denotes that its elements are broad and generic, usable for describing a wide range of resources).

The Dublin Core Metadata Initiative provides simple standards to facilitate the finding, sharing and management of information. DCMI does this by:

- Developing and maintaining international standards for describing resources
- Supporting a worldwide community of users and developers
- Promoting widespread use of Dublin Core solutions

Table 19.2: Simple Dublin Core Metadata Element Set (15 elements)

Sr.No.	Elements	Description
1.	Contributor	An entity responsible for making contributions to the resource.
2.	Coverage	The spatial or temporal topic of the resource, the spatial applicability of the resource, or the jurisdiction under which the resource is relevant.
3.	Creator	An entity primarily responsible for making the resource
4.	Date	A point or period of time associated with an event in the lifecycle of the resource.
5.	Description	An account of the resource.
6.	Format	The file format, physical medium, or dimensions of the resource.
7.	Identifier	An unambiguous reference to the resource within a given context.
8.	Language	A language of the resource.
9.	Publisher	An entity responsible for making the resource available.
10.	Relation	A related resource.
11.	Rights	Information about rights held in and over the resource.
12.	Source	A related resource from which the described resource is derived.
13.	Subject	The topic of the resource.
14.	Title	A name given to the resource.
15.	Type	The nature or genre of the resource.

The development and maintenance of a core set of metadata terms (the DCMI Metadata Terms) continues to be one of the main activities of DCMI. DCMI promotes the adoption of standardized approaches to metadata and the architectures which support the creation and exchange of interoperable metadata. In addition, DCMI is developing guidelines and procedures to help implementers define and describe their usage of Dublin Core metadata in the form of Application Profiles. This work is done in a work structure

that provides discussion and cooperation platforms for specific communities (e.g. education, government information, and corporate knowledge management) or specific interests (e.g. technical architecture, accessibility).

The Dublin Core metadata standard is a simple yet effective element set for describing a wide range of networked resources. The Dublin Core standard includes two levels: Simple and Qualified. Simple Dublin Core comprises fifteen elements; Qualified Dublin Core includes three additional elements (Audience, Provenance and RightsHolder), as well as a group of element refinements (also called qualifiers) that refine the semantics of the elements in ways that may be useful in resource discovery. The Dublin Core basic/simple element set is outlined in Table 19.2. Each element is optional and may be repeated. Most elements also have a limited set of qualifiers or refinements, attributes that may be used to further refine (not extend) the meaning of the element.

Qualified Dublin Core

Qualified Dublin Core (Table 19.3) includes seven additional elements (Audience, Provenance, Rights Holder, Instructional method, Accrual Method, Accrual Periodicity, and Accrual Policy), as well as a group of element refinements (also called qualifiers) that refine the semantics of the elements in ways that may be useful in resource discovery.

Table 19.3: Qualified Dublin Core

Sr.No.	DCMES Element	Element Refinement(s)
1.	Title	Alternative
2.	Creator	
3.	Subject	
4.	Description	Table of Contents, Abstract
5.	Publisher	
6.	Contributor	
7.	Date	Created, Valid, Available, Issued, Modified, Date Accepted, Date Copyrighted, Date Submitted
8.	Type	
9.	Format	Extent, Medium
10.	Identifier	Bibliographic citation
11.	Source	
12.	Language	
13.	Relation	Is Version Of, Has Version, Is Replaced By, Replaces, Is Required By, Requires, Is Part Of, Has Part, Is Referenced By, References, Is Format Of, Has Format, Conforms To
14.	Coverage	Spatial, Temporal
15.	Rights	Access rights, License
16.	Audience	Mediator, Education level
17.	Provenance	
18.	Rights holder	
19.	Instructional method	
20.	Accrual Method,	
21.	Accrual Periodicity,	
22.	Accrual Policy,	

The Simple Dublin Core and the Qualified Dublin Core described above are part of a larger set of metadata vocabularies and technical specifications maintained by the Dublin Core Metadata Initiative (DCMI). The full set of vocabularies, DCMI Metadata Terms [DCMI-TERMS] (see Table 19.4), also includes sets of resource classes (including the DCMI Type Vocabulary [DCMI-TYPE]), vocabulary encoding schemes, and syntax encoding schemes. For a description for all other terms one is required to view the DUBLIN CORE website at <http://dublincore.org/documents/dcmi-terms/>)

Table 19.4: DCMI Metadata Terms

Properties in the /terms/ namespace	abstract, access Rights, accrual Method, accrual Periodicity, accrual Policy, alternative, audience, available, bibliographic Citation, conforms To, contributor, coverage, created, creator, date, date Accepted, date Copyrighted, date Submitted, description, education Level, extent, format, has Format, has Part, has Version, identifier, instructional Method, is Format Of, is Part Of, is Referenced By, is Replaced By, is Required By, issued, is Version Of, language, license, mediator, medium, modified, provenance, publisher, references, relation, replaces, requires, rights, rights Holder, source, spatial, subject, table Of Contents, temporal, title, type, valid
Properties in the legacy /elements/1.1/ namespace	contributor, coverage, creator, date, description, format, identifier, language, publisher, relation, rights, source, subject, title, type
Vocabulary Encoding Schemes	DCMI Type, DDC, IMT, LCC, LCSH, MESH, NLM, TGN, UDC
Syntax Encoding Schemes	Box, ISO3166, ISO639-2, ISO639-3, Period, Point, RFC1766, RFC3066, RFC4646, URI, W3CDTF
Classes	Agent, Agent Class, Bibliographic Resource, File Format, Frequency, Jurisdiction, License Document, Linguistic System, Location, Location Period Or Jurisdiction, Media Type, Media Type Or Extent, Method Of Accrual, Method Of Instruction, Period Of Time, Physical Medium, Physical Resource, Policy, Provenance Statement, Rights Statement, SizeOrDuration, Standard

19.3.3 Instructional Management Specification (IMS)

IMS is originally an abbreviation for Instructional Management Specification, and is now also commonly used as the short form for the IMS Global Learning Consortium. The IMS Global Learning Consortium creates standards for the development and adoption of technologies that enable high-quality, accessible, and affordable learning experiences. IMS GLC is now enabling the next generation of Digital Learning Services, combining new forms of digital content, assessment, applications, and administrative services.

The IMS Global Learning Consortium strives to enable the growth and impact of learning technology in the education and corporate learning sectors worldwide. IMS GLC members provide leadership in shaping and growing the learning industry through community development of interoperability and adoption practice standards and recognition of the return on investment from learning and educational technology.

IMS GLC has approved and published some 20 standards of which 17 are the most widely used learning technology standards in the world (see Table 19.5). These IMS GLC standards include Accessibility, Competency Definitions, Content Packaging, Digital Repositories, Enterprise, Enterprise Services, ePortfolio, General Web Services, Learner Information, Learning Design, Meta-data, Question and Test Interoperability, Resource List

Interoperability, Shareable State Persistence, Simple Sequencing, Tools Interoperability, and Vocabulary Definition Exchange. These standards have been used widely in higher education, K-12 education, and corporate training in regions around the globe. All IMS GLC standards are available to be downloaded from its website at <http://www.imsglobal.org/specifications.html>.

Table 19.5: IMS Standards and their Descriptions

Sr. No.	Specification/ Standards	Description
1.	Accessibility	The Access For All Meta-data specification is intended to make it possible to identify resources that match a user's stated preferences or needs. These preferences or needs would be declared using the IMS Learner Information Package Accessibility for LIP specification. The needs and preferences addressed include the need or preference for alternative presentations of resources, alternative methods of controlling resources, alternative equivalents to the resources themselves and enhancements or supports required by the user. The specification provides a common language for identifying and describing the primary or default resource and equivalent alternatives for that resource.
2.	Competency Definitions	The Reusable Definition of Competency or Educational Objective (RDCEO) specification provides a means to create common understandings of competencies that appear as part of a learning or career plan, as learning pre-requisites, or as learning outcomes. The information model in this specification can be used to exchange these definitions between learning systems, human resource systems, learning content, competency or skills repositories, and other relevant systems.
3.	Content Packaging	The issue with content is how to launch it so that it can access information about the learner and return information about the learner's interaction to the learning management system. This may be, very simply: the learner's name in one direction, and started and finished markers coming back; or it may be complex, providing access to the Learner's Profile, where the content can gain access to the learner's preferences and past performance and receives back detailed performance information.
4.	Digital Repositories	The IMS Digital Repositories purpose is to provide recommendations for the interoperation of the most common repository functions. These recommendations should be implementable across services to enable them to present a common interface. On the broadest level, this specification defines digital repositories as being any collection of resources that are accessible via a network without prior knowledge of the structure of the collection. Repositories may hold actual assets or the meta-data that describe assets. The assets and their meta-data do not need to be held in the same repository.
5.	Enterprise	Its core focus is to integrate learning systems with existing systems within the enterprise. There is now a wide range of systems, including eMail, Personnel, Resource Planning, LDAP, Scheduling and many others.
6.	Enterprise Services	The Enterprise Services specification is the definition of how systems manage the exchange of information that describes people, groups and memberships within the context of learning.
7.	ePortfolio	The IMS ePortfolio specification was created to make ePortfolios interoperable across different systems and institutions. The ePortfolio specification: Supports the advancement of lifelong learning important to many government initiatives, Makes exchanging portfolios from school to work transitions easier, Allows educators and institutions to better track competencies, and enhances the learning experience and improves employee development.
8.	General Web Services	The General Web Services Base Profile promotes interoperability for web service based specification implementations on different software and vendor platforms. The Base Profile focuses on a core set of web service specifications and the most common problems experienced implementing the identified web service specifications.
9.	Learner Information	Learner Information is a collection of information about a Learner (individual or group learners) or a Producer of learning content (creators, providers or vendors). The IMS Learner Information Package (IMS LIP) specification addresses the interoperability of internet-based Learner Information systems with other systems that support the Internet learning environment. The intent of the specification is to define a set of packages that can be used to import data into and extract data from an IMS compliant Learner Information server. The core structures of the IMS LIP are based upon: accessibilities; activities; affiliations; competencies; goals; identifications; interests; qualifications, certifications and licences; relationship; security keys; and transcripts.

Sr. No.	Specification/ Standards	Description
10.	Learning Design	Learning Design specification supports the use of a wide range of pedagogies in online learning. Rather than attempting to capture the specifics of many pedagogies, it does this by providing a generic and flexible language. This language is designed to enable many different pedagogies to be expressed. The approach has the advantage over alternatives in that only one set of learning design and runtime tools then need to be implemented in order to support the desired wide range of pedagogies.
11.	Meta-data	The purpose of metadata is primarily to enable searching and retrieval of learning content. It does this through provision of information about the Content. The task is to define the structure and format of fields for this and their range of values where appropriate.
12.	Question and Test Interoperability	Related to content in use are questions and test which can be used to monitor learners' progress, determine the next activities or formally to assess the learner. The key issue is to separate the content of the question from its presentation, so that it can be easily ported across systems and over time. Formats for different question and presentation types are being agreed, as are types and formats for returning results
13.	Resource List Interoperability	The Resource List Interoperability (RLI) specification details how structured meta-data can be exchanged between systems that store and expose resources for the purpose of creating resource lists and those that gather and organize those Resource Lists for educational or training purposes.
14.	Shareable State Persistence	The Shareable State Persistence specification describes an extension to e-learning runtime systems (e.g., SCORM) that enables the storage of and shared access to state information between content objects.
15.	Simple Sequencing	The IMS Simple Sequencing Specification defines a method for representing the intended behavior of an authored learning experience such that any learning technology system (LTS) can sequence discrete learning activities in a consistent way. The specification defines the required behaviors and functionality that conforming systems must implement.
16.	Tools Interoperability	The IMS Tools Interoperability (TI) approach addresses the growing demand for a reusable mechanism for integrating third-party tools with core LMS platforms. Tools can add specialist functionality to the LMS such as assessment or discipline-specific teaching aids. The reuse of a commonly understood approach across tools will eliminate the need for bilateral solutions, thus focusing investment on adding real value to the learner experience.
17.	Vocabulary Definition Exchange	The IMS Vocabulary Definition Exchange (VDEX) specification defines a grammar for the exchange of value lists of various classes: collections often denoted "vocabulary". Specifically, VDEX defines a grammar for the exchange of simple machine-readable lists of values, or terms, together with information that may aid a human being in understanding the meaning or applicability of the various terms.

The scope for IMS specifications, broadly defined as "distributed learning," includes both online and off-line settings, taking place synchronously (real-time) or asynchronously. This means that the learning contexts benefiting from IMS specifications include Internet-specific environments (such as web-based course management systems) as well as learning situations that involve off-line electronic resources (such as a learner accessing learning resources on a CD-ROM).

19.3.4 Institute of Electrical and Electronics Engineers (IEEE) Learning Technology Standards Committee (LTSC)

The IEEE Learning Technology Standards Committee (LTSC) operates under the auspices of the IEEE Standards Association and the IEEE Computer Society Standards Activity Board. The IEEE LTSC is chartered to develop accredited technical standards, recommended practices, and guides for learning technology. "Learning technology" includes software components, tools, technologies, and design methods that facilitate development, deployment, maintenance, and interoperation of computer-based education and training components and systems.

The IEEE-LTSC working groups include:

- 1484.12: Learning Object Metadata (LOM)
- 1484.20: Competencies
- 1484.11: Computer Managed Instruction (CMI)
- 1484.13: Resource Aggregation Models for Learning Education and Training (RAMLET)

Their published Standards include:

- 1484.20.1-2007 IEEE Standard for Learning Technology-Data Model for Reusable Competency Definitions
- 1484.4-2007 IEEE Trial-Use Recommended Practice for Digital Rights Expression Languages (DREs) Suitable for eLearning Technologies
- 1484.11.3-2005 IEEE Standard for Learning Technology-Extensible Markup Language (XML) Schema Binding for Data Model for Content Object Communication
- 1484.12.3-2005 IEEE Standard for Learning Technology-Extensible Markup Language (XML) Schema Definition Language Binding for Learning Object Metadata
- 1484.11.1-2004 IEEE Standard for Learning Technology-Data Model for Content to Learning Management System Communication
- 1484.11.2-2003 IEEE Standard for Learning Technology-ECMAScript Application Programming Interface for Content to Runtime Services Communication
- 1484.12.1-2002 IEEE Standard for Learning Object Metadata

19.3.5 Sharable Content Object Reference Model (SCORM)

Building on all of the above work, the Advanced Distributed Learning (ADL) initiative of the U.S. Department of Defense has created a unified collection of core specifications, the Sharable Content Object Reference Model (SCORM). SCORM refers specifically to content, technologies, and services for online educational application (e-learning). SCORM is not a standard; it is a detailed implementation reference which, if followed, allows systems, content, and technologies to “talk” to each other. SCORM is still being developed and refined by ADL and other government, academic and corporate groups.

SCORM currently includes specifications for describing, sequencing, and joining learning objects; enabling communication between learning objects and learning management systems; and data tracking. Vendors of products that create and manage learning objects can use the SCORM specifications to ensure interoperability among their products.

SCORM (sharable content object reference model) is a collection of related specifications and standards aimed at the creation of interoperable, accessible, durable, affordable, and re-usable learning content (ADL, 2004). What is particularly important about SCORM is the fact that it does not introduce new specifications or standards, but it coordinates and refers to already established technical standards, specifications, and guidelines introduced by other international organisations committed to e-learning standardization, such as the IMS, the IEEE LTSC, ARIADNE, and AICC. This further justifies the wide acceptance and significant impact of SCORM on the e-learning industry world wide.

To help stimulate industry agreement, SCORM defined the high-level-functional requirements, or ‘abilities’ for all SCORM-compliant e-learning environments. They are the foundation on which the SCORM is based (Table 19.6).

Table 19.6: SCORM Requirements

Requirement	Explanation
Accessibility	The ability to locate and access instructional components from one remote location and deliver them to many other locations
Interoperability	The ability to take instructional components developed in one location with one set of tools or platforms and use them in another location with a different set of tools or platforms.
Durability	The ability to withstand technology evolution and changes without costly redesign, reconfiguration or recoding
Reusability	The ability to incorporate instructional components in multiple applications and contexts.

Source: SCORM® 2004 4th Edition Overview Version 1.0

In addition to the “abilities,” another foundational concept for SCORM is the “Web-enabled assumption,” which asserts that the Web provides the best opportunity to maximize access to and reuse of learning content. The Web-based assumption embraces industry’s transition to common content and delivery formats. Combining the “abilities” with the Web-based assumption, SCORM’s operational principles offer the ability for:

- Web-based learning management systems (LMSs) to launch content that is authored using tools from different vendors and to exchange data with that content.
- Web-based LMS products from different vendors to launch the same content and exchange data with that content during execution.
- Multiple Web-based LMS products/environments to access a common repository of executable content and to launch such content.

SCORM is a collection, integration and harmonization of specifications and standards that have been bundled into a collection of “technical books.” These technical books are presently grouped under three main topics: the Content Aggregation Model (CAM), the Run-time Environment (RTE) and Sequencing and Navigation (SN). Table 19.7 gives summary of these books.

Table 19.7: SCORM Book Coverage

Book	Concepts Covered	Technologies Covered	Areas of Overlap
Overview	High level conceptual information	Introduction to numerous high-level elements of SCORM terminology	Covers areas of the CAM, RTE and SN books at a high level
Content Aggregation Model (CAM)	Assembling, labeling and packaging of learning content	SCO, Asset, Content Aggregation, Package, Package Interchange File (PIF), Metadata, Sequencing Information, Navigation Information	SCOs and manifests, SCOs communicate with an LMS via the RTE. Manifests contain Sequencing and Navigation Information
Run-Time Environment (RTE)	LMS’s management of the RTE, including launch, content to LMS tracking, data transfer and error handling	API, API instance, Launch, Session Methods, Data Transfer, Support Methods, Technical Model, Run-Time Data Model	SCOs are described in the CAM book and are content objects that use the RTE
Sequencing and Navigation (SN)	Sequencing content and navigation	Activity Tree, Learning Activities, Sequencing Information, Navigation Information	Sequencing and Navigation affects how content is assembled in a manifest

Source: SCORM® 2004 4th Edition Overview Version 1.0

Check Your Progress 19.3

Notes: a) Write your answer in the space given below.
b) Compare your answer with those given at the end of this unit.

- 1) List at least five basic Dublin Core metadata elements.

.....

.....

.....

.....

.....

- 2) Explain competency in the context of IMS.

.....

.....

.....

.....

.....

- 3) What is SCORM?

.....

.....

.....

.....

.....

19.3.6 Alliance of Remote Instructional Authoring and Distribution Networks for Europe (ARIADNE)

This is a European association open to the world, for knowledge sharing and reuse. The core of the ARIADNE infrastructure is a distributed network of learning repositories. The ARIADNE Foundation was created to exploit and further develop the results of the ARIADNE and ARIADNE II European Projects, which created tools and methodologies for producing, managing and reusing computer-based pedagogical elements and telematics supported training curricula.

The goal of the ARIADNE project is to define implement and test suitable methodologies and tools for enabling telematics-based solutions in academic education, open and distance learning and certain types of corporate training. ARIADNE explicitly addresses four aspects of the teaching process:

- Producing computer based teaching material
- Managing this material to permit sharing and reuse
- Assembling courses
- Delivering courses to students

ARIADNE Tools

ARIADNE uses a set of tools to achieve its objectives:

- **Search & Index Learning Objects (SILO):** Though ARIADNE target integration of their services into third party applications, they offer a query and indexation tool. The ARIADNE Search & Indexation tool allows ARIADNE users to upload, describe and publish learning objects. Silo supports 4 usage rights levels that can be associated to every learning object.
- **The Ariadne Web Service:** It is a software package that runs on a Jakarta Tomcat server. This tool offers web services through which external applications can communicate with the ARIADNE knowledge pool system. This tool is thus not intended to be used by end users. The tool however offers a webpage through which an ARIADNE administrator can create ARIADNE account, manage and test an ARIADNE KPS instance.
- **Federated Search (GLOBE):** Searching beyond the borders of ARIADNE is of great value to this community. This middleware software enables transparent search into various repositories (GLOBE, ProLearn, MACE & MELT). These sites rely on standards such as SQI and LOM for doing federated search. By the addition of new repository to the federated search infrastructure, more heterogeneous content becomes available to the ARIADNE community.
- **Integrated Learning Management Systems:** At the beginning, ARIADNE provided its members with both a Learning Object Repository (LOR) and a Learning Management System (LMS) that offered learning services while interacting with learning objects stored into the Knowledge Pool. However more recently ARIADNE decided to focus on its LOR and to build API dedicated to specific LMS and providing the opportunity to interoperate with the Knowledge Pool and others LOR included in the Federated Search. These API allow to:
 - **query LOR from LMS** and to retrieve learning objects metadata
 - **download** the matching **documents** on the local host
 - **integrate** the matching **documents** into the dedicated space of the LMS in order to deploy this resource **within a courseware**
 - **index new learning objects** into a LOR starting from a LMS.

An API is available for the well-known Moodle LMS. It allows to create, modify, and delete coursewares and to view existing ones which do not require a password.

- **Phoenix:** This authoring tool allows indexing pedagogical material and inserting it into the Knowledge Pool System.
- **Attention Metadata:** In order to create a feedback loop that enables learning from the way people actually use new technologies and tools for learning, it is essential to track the behavior of users and learners. Users usually interact with a wide variety of tools that use learning objects in one way or another. Attention metadata given to learning objects in those tools can be tracked merged and analyzed to facilitate providing users with their relevant objects.
- **The ALOCOM ontology:** is a generic content model that defines a framework for RLOs and their components. The ontology defines concepts representing different RLO component types and their structure. This explicit definition of both content and structure enables the disaggregation of RLOs into their components.

- **Information visualization:** A technique which can enable users to find learning objects in learning object repositories in a more flexible and effective way than filling out electronic forms, which is the way it is currently done in repositories like the Ariadne Knowledge Pool System.
- **Automatic Metadata Generation (AMG):** One of the main concerns in learning technology research is the problem of acquiring the critical mass to establish real reuse. ARIADNE focus on is the creation of metadata. Without appropriate metadata no learning content will be really reusable because it will be difficult or impossible to identify and retrieve it. ARIADNE is currently working on a system to enable automatic creation of learning object metadata. In this way, the users do not have to bother with the metadata if they do not want to. This can be compared with search engines on the web that index web pages in the background without any intervention of the creator or the host of the site.

19.4 STRUCTURE AND COMPONENT OF LEARNING OBJECTS

The structure and composite nature of a learning object is still open to interpretation. Content models provide a framework for defining the structure, that is, the level of aggregation/granularity of learning objects. Cisco Systems proposed five aggregation levels for structuring learning content:

- 1) Subtopic
- 2) Topic or RIO (reusable information object)
- 3) Lesson or RLO (reusable learning object)
- 4) Module
- 5) Course

A course is comprised of a collection of modules, which in turn include collections of lessons. A lesson can be reusable in multiple courses and learning contexts. A lesson or reusable learning object consists of a single learning objective, an overview, a summary, and a collection of topics (or RIO), as well as practice activities, assessment, and metadata. In particular, five to nine reusable information objects can be combined to form a learning object (Barron, 2002). A topic is a self-contained reusable information object that consists of subtopics (such as small chunks of information of various types such as definitions, examples, tables, guidelines, etc.), assessment, practice activities, and metadata. Topics are grouped into five category types, including concepts, facts, procedures, processes, and principles. Both RLO and RIO components (such as content, activities, and assessment) can be represented in various media formats such as text, audio, animation, videos, Java code, applets, and other delivery media (Cisco Systems, 2003). It is worth mentioning, however, that although Cisco initially treated a single lesson as a learning object, for the purpose of terminological simplicity, Version 4.5 of the strategy regards each aggregation level (from topics to courses) as a learning object (Cisco Systems, 2003). This revision, however, broadens the scope of a learning object and does not specify its exact position in the course hierarchy as it did previously.

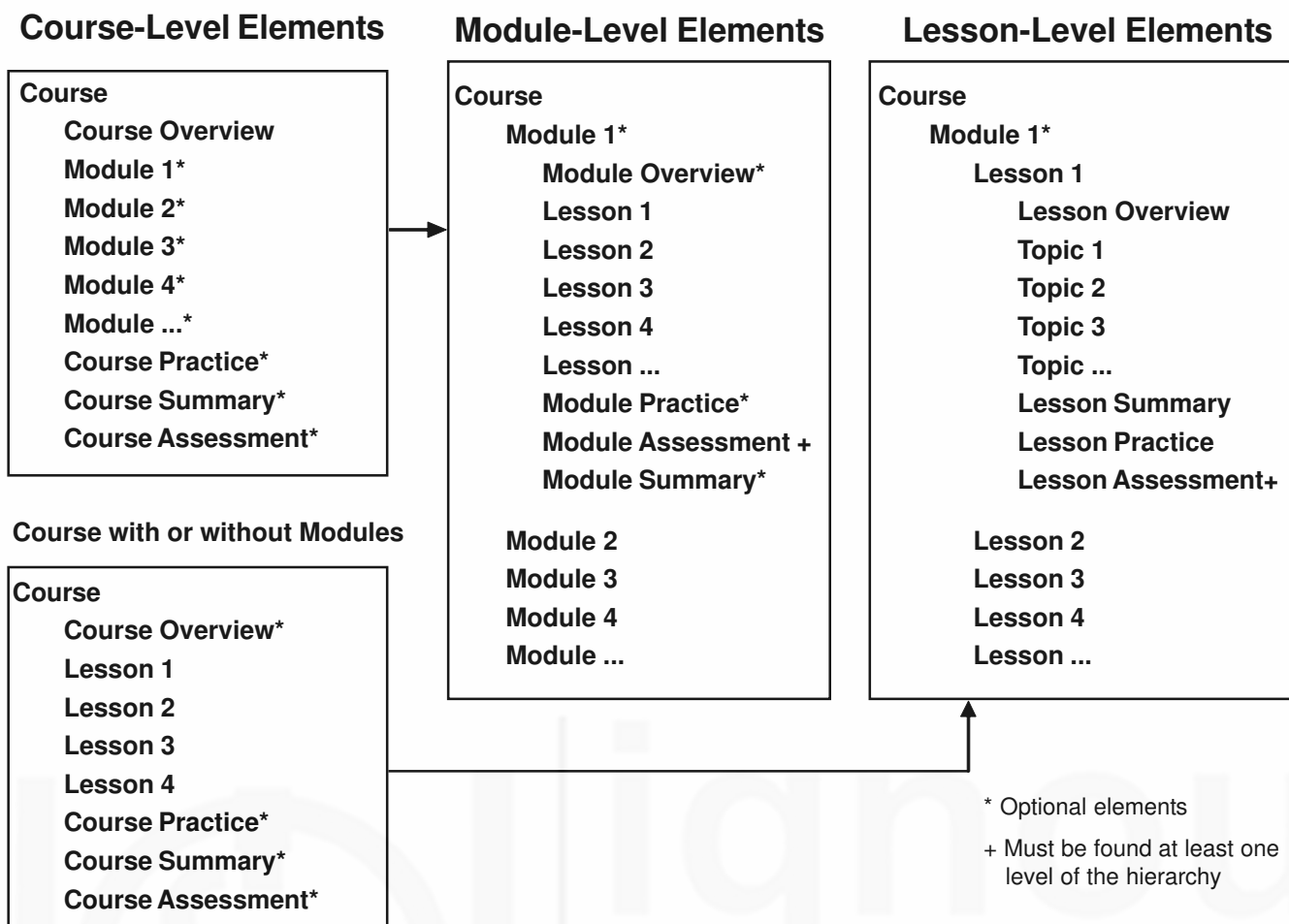


Figure 19.1: Elements of Learning Objects (*Source*: CISCO Systems, 2003)

Over the years, Cisco published a strategy for developing and implementing reusable learning objects (RLOs). This is known as Reusable Information Object Strategy (RIO). The RIO Strategy is built upon the Reusable Information Object (RIO). An RIO is granular, reusable chunk of information that is media independent. An RIO can be developed once, and delivered in multiple delivery mediums. Each RIO can stand alone as a collection of content items, practice items and assessment items that are combined based on a single learning objective. RIOs are then combined to form a larger structure called a Reusable Learning Object (RLO).

A Reusable Learning Object is created by combining an overview, summary, assessment and five to nine (7 + 2) RIOs and it is shown in the Figure 19.2.

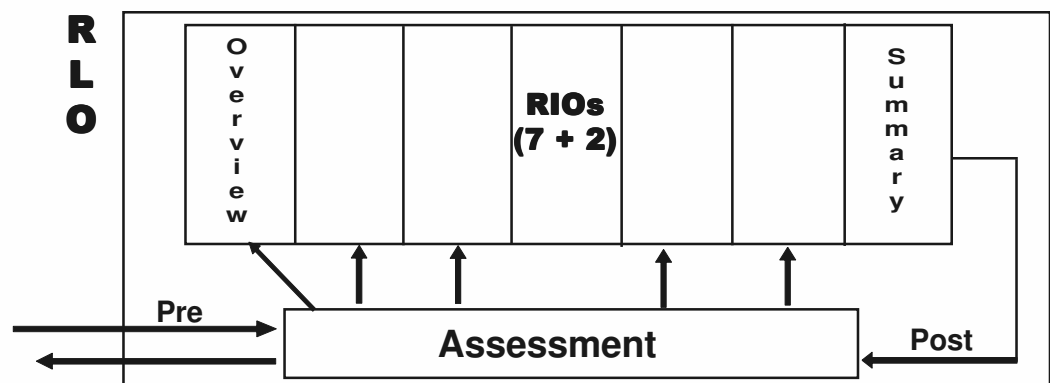


Figure 19.2: Components of Reusable Learning Objects
(*Source*: CISCO Systems, 1999)

An RLO is based on a single objective, derived from a specific job task. Each RIO is built upon an objective that supports the RLO's objective.

Inside RIO

Combining content items, practice items and assessment items creates a Reusable Information Object. Each RIO is built upon a single objective. As defined by Information Mapping, each RIO is classified as either being a Concept, Fact, Process, Principle or Procedure.

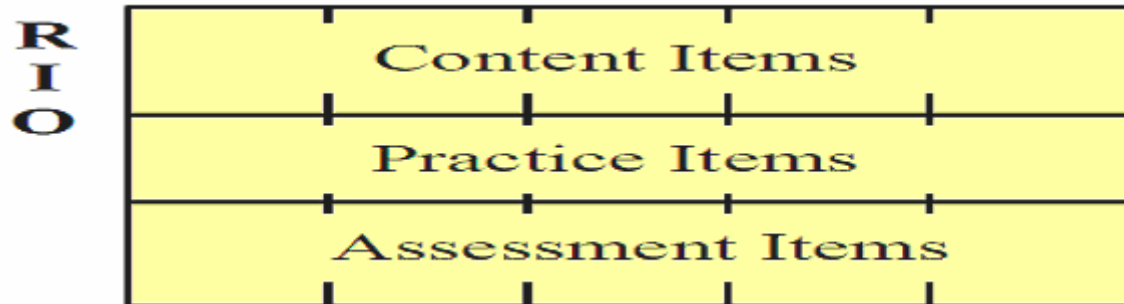


Figure 19.3: Components of Reusable Information Objects (Source: CISCO Systems, 1999)

The learner may choose to take the entire RLO, which could be called a "lesson." As in any traditional lesson, the RLO gives the Learner the needed learning context, the knowledge and skills they need to perform the given objective, and a method to assess mastery.

Practice Items: The intent of a practice activity is to assist the learner in encoding and integrating new knowledge, as well as to help the learner get ready for the final assessment. The practice provides instructional feedback and points to topics the learner should review for further study.

Assessment Items: The assessment is intended to be a final experience, associated with a passing or failing grade. Assessment is any activity designed to confirm that a learner has mastered the performance objectives at the course, module, or lesson level.

The following is a list of some of the types of information that may be included in a learning object and its metadata:

- General Course Descriptive Data, including: course identifiers, language of content , subject area , descriptive text, descriptive keywords
- Life Cycle, including: version, status
- Instructional Content, including: text, web pages, images, sound, video
- Glossary of Terms, including: terms, definition, acronyms
- Quizzes and Assessments, including: questions, answers
- Rights, including: cost, copyrights, restrictions on Use
- Relationships to Other Courses, including prerequisite courses
- Educational Level, including: grade level, age range, typical learning time, and difficulty.

Check Your Progress 19.4

Notes: a) Write your answers in the space given below.
b) Compare your answers with those given at the end of this unit.

1) What are the components of RIO?

.....

.....

.....

.....

2) What are the aggregation levels of LO?

.....

.....

.....

.....

19.5 LEARNING OBJECT CREATION PROCESS

The Cisco System Corporation proposed a four phase system for RLO's creation. Each of these phases interacts with each other. This system has built into it a blend of traditional Instructional System Design (ISD) steps as well as newer computer instructional elements (See Figure 19.4).

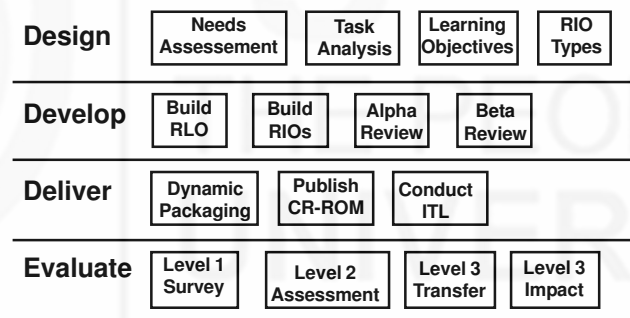


Figure 19.4: Instructional System Design for Learning Objects

As depicted in the Figure 19.4, the phases are:

- **Design** - The design phase is where the foundation of the learning event is created. There are four stages included in this phase: Needs Assessment, Task Analysis, Learning Objectives, and RIO Types. When designing learning objects, it is pertinent to consider how many objectives should be included. If too many are included, the object may become large, which will limit its ability to be reused by other individuals.
- **Develop** - Now that the Design phase has been completed, the RIOs can be developed. At this phase, text, graphics, video, and other content are built. Content items, practice items and assessment items are created based on the learning objects defined in the Design phase.
- **Deliver** - At the beginning of this phase, the RLO's are complete and produced. The RLO would be stored in a database and are ready of use. Packaging of the RLO for delivery to the user must be decided. Three common types of delivery are: Dynamic Web Packages, CD-ROM's, and Instructor-Led Training Materials.

- **Evaluate** - The evaluation phase is built off of Kirkpatrick's four levels of evaluation. According to Cisco using these four levels will allow the author or organization to be able to make judgements about the effectiveness of the RLO.

The details of all the phases are given in a Table 19.8:

Table 19.8: Steps in Creation and Use of Learning Objects

Design	Develop	Deliver	Evaluate
Need Assessment An RLO and each RIO must be created to solve a real need in the organization. The need must be measurable and quantifiable in order for the training intervention, or RIOs in this case, to be successfully implemented. Task Analysis In this step the Author relates the needs to specific job tasks. At this stage the Author identify the knowledge and skills that are critical to meet the training needs identified in Stage 1. With a specific job task identified, the Author adds other "need-to-know" information that helps the Learner learn the job task (such as a definition of a fact, or an explanation of a concept or process). The combination of these elements forms a hierarchy of RIOs, which are nested into RLOs. Learning Objectives Once the job tasks have been analyzed, the Author creates learning objectives for each RLO and for each RIO. Objectives tell the Learner what they must do in order to achieve mastery. For the Author, they identify what type of practice and assessment should be included in the RIO in order to assure mastery. Each objective consists of an action statement, a performance condition and a performance criterion. RIO Types The Author uses the learning objective to categorize each RIO as a concept, fact process, principle, and procedure.	Build RLO Using published guidelines and templates, the Author builds an RLO to meet the design requirements specified in the Design phase. Each RLO is constructed out of overview, RIOs (7 ± 2), summary, and assessment Build RIOs Using published guidelines and templates for each type of RIO (concept, fact, process, principle, and procedure), the Author builds an RIO to meet the requirements specified in the Design phase. Regardless of the type of RIO, each is built out these three elements: ▪ Content items ▪ Practice items ▪ Assessment items Media production for each item would also begin at this stage. This includes graphics, video clips, simulations and so on. Alpha Review An alpha version of a program is also known as a "pilot" version, which can be tested for overall usability and training effectiveness. Beta Review An important function of quality control and one of the last steps before release of a RLO. Beta testing involves the use of a RLO by selected users to create a formal documentation of content errors, software bugs, usability, level of engagement, and other factors.	Dynamic Web Packages In this case, Web pages are built as needed and delivered to the Learner through a Web browser. When the Learner wants to take a "lesson" or reference a "job aid" they simply request the raw items that make up the RLO and RIO from the database. Format and style sheets are then applied to the objects as they are packaged and delivered to the Learner's Web browser. CD-ROM's In cases where the Learner is separated from a network connection, due to travel, or other physical constraints, RLO-RIOs can be packaged onto a physical medium such as a CD-ROM. ITL The need for live, instructor led training will not diminish because of the availability of Web based training. The RIO Strategy supports the creation of instructor-led training materials such as student workbooks, instructor guides, learning activities and presentation materials. Because RIOs are stored free of format and style, they can be packaged using style sheets and templates specific for instructor-led training delivery.	Level I Survey Measures the Learner's reaction to the event (Did Learners like it?). Sometimes called "smile sheets," Level 1 measures if the Learner liked the training. It is all opinion based and does not test actual learning. However, the data collected at this level is important for business and development considerations. Level II Assessment Measures if the learning objectives have been met immediately following the event (Did Learners learn?). The Level 2 assessment should match the objective found in the RIO, and therefore must be job-task focused. Level III Transfer Measures the transfer of skills back to the job (Are they using it?). This level determines if the Learners actually are using what the RIO taught them when back on the job. Usually, transfer is measured through some type of 360 degree peer/manager review and by observation. Simply re-testing the Learner can indicate only if they still have the knowledge and skills, not if they are actually using them on the job. Ideally, the same instrument used during the needs would be used to test if job transfer occurred as a result of the RIO. Level IV Impact Measures the impact on the business (Did it matter?). Level 4 measures how the organization's bottom line was affected as a result of the RIO. Examples include increase in profitability, increase in customer satisfaction, increase in sales, and decrease in returns. Correlating business impact, productivity and return on investment (ROI) to any training intervention can be a laborious process.

19.6 TYPES OF LEARNING OBJECTS

CISCO has specified five types of learning objects: concept, fact, procedure, process, and principle.

Concept: A Concept RLO is used when you need to teach a group of objects, symbols, ideas, or events which:

- Are designated by a single word or term
- Share a common feature
- Vary on irrelevant features

A Concept RLO is made of content items (Introduction, Definition, Facts, Examples, Non-Examples, Analogy, and Instructor Notes), Practice items, and Assessment items

Fact: A fact RLO is unique in that it can be taught as either a standalone RLO or a link from another RLO. Facts are presented as statements, data, or pictures of specific objects. Use a fact topic when you need teach unique, specific, one-of-a-kind pieces of information. Ideally, a fact would have a link to the concept, procedure, process, or principle that it is referencing (or vice versa). Sequence facts so that they flow logically within the lesson, or better yet, link a fact to the other topics that reference that fact.

Procedure: A procedure is a sequential set of steps to be followed by one individual to accomplish a task or make decisions. It lists directions for procedural tasks. Actions within a procedure must be done the same way each time (within a given situation). Use a procedure RLO when you need to teach a procedure performed on the job. For the learner to be successful, the procedures must be clear. In addition, the RLO must provide job-based practice for transfer to the job. Typically, a procedure RLO will come after a concept or process RLO. For example, if you are creating a lesson to teach the configuration of a router, the concept topic titled “What is a Router?” may be taught first.

Process: Use a process RLO when you need to teach how a system works. A process RLO is helpful in supporting underlying job tasks, providing motivation, and ensuring the overall quality of job performance. A process can be defined as:

- A flow of events that describes how something works
- A task that involves many persons or organizations, not a task to be done by one person
- Mechanical, business, or scientific

You can place a process RLO at any point within a lesson. If the goal of the lesson is to teach the process, then multiple processes may be included with concept topics. If a process topic is being presented to establish the context of a procedure, then it should come before the procedure topic within the lesson.

Principle: Use a principle RLO when you need to create a job task that requires judgment or when guidelines must be applied to a job situation. Typically, a principle RLO will come after a concept or process RLO. For example, if you are creating a lesson to teach the guidelines for handling employee conflicts, the concept topic titled “What Is a Conflict?” may be taught first.

- Guidelines for handling employees with personal problems
- Guidelines for designing effective visual aids
- Responding appropriately to an angry customer
- Designing learner-centered training

Table 19.9 gives a comparison of all five types with example.

Table 19.9: Types of Learning Objects

Item	Definition	Examples	Sample Titles
Concept	A group of objects, symbols, ideas, or events that are defined by a single word or term, share common features, and vary only in irrelevant features.	Look for multiple examples of the class or group that share common features and that are designated by a single word or term; for example: user, forms, router, needs, requirements, or PSTN.	• “What Is the PSTN?” • “What Is a Router?”
Fact	Unique, specific information in the form of a statement or data or pictures of specific objects.	Look for unique specific information in the form of a statement or data or picture of specific objects; for example, the setup script on the Cisco 2500 router, or the number of card slots on a Catalyst 5500 switch.	• “About the Cisco 2500 Router Setup Script” • “About Cisco Catalyst 5500 Switch Slots” • “About the Footprint Size of the Cisco 7600 Router”
Procedure	A sequence of steps to be followed by one individual to accomplish a task or make a decision. A procedure contains directions or procedural tasks and contains actions that are done the same way each time.	Look for directive steps, second person language, and active voice; for example, how to log on to a computer.	• “How to Log on to a Computer” • “How to Access the Learning Content Development Pack”
Process	A flow of events that describes how something works. It is not necessarily a task done by one person; many people or an organization may be involved.	Look for descriptive stages, third person language, and passive voice; for example, identifying data link layer problems.	• “Identifying Common Physical and Data Link Layer Problem Resolutions” • “Routing Messages” • “Implementing the Course Development Process”
Principle	Directions for tasks that provide employees with guidelines for action. Employees must adapt the guidelines to various job situations. Principles require employees to use judgment and discretion when they apply them. Ask yourself these questions: Is the task completed in a different way each time? Does the outcome of the task rely on the circumstances and on the learner’s judgment?	Look for guidelines and judgment calls; for example, designing a multilayer switched network.	• “Guidelines for Designing a Multilayer Switched Network” • “Positioning the Cisco Catalyst 5500 to IT Managers” • “Handling Customer Objections”

(Source: CISCO Systems, 2003)

Check Your Progress 19.5

Notes: a) Write your answer in the space given below.

b) Compare your answer with the one given at the end of this unit.

What are the five types of LOs? Give example of each of them.

.....

.....

.....

.....

.....

19.7 LET US SUM UP

In this unit we discussed the concept of reusable learning objects, and associated industry standards to develop learning objects. We discussed that learning objects mean many things to many people, and therefore, a common understanding is important. We defined learning objects as digital object/resource that is adaptable, reusable, independent, granular, and interoperable in nature. We discussed the characteristics and advantages of learning objects (LOs). LO being reusable, can save resources and also save development time of online courses. However, there are also criticisms for the learning object strategy, as it has its origin in the Army, and at a very simple level, learning is contextual, and objects cannot carry the context with them.

We also described the learning object metadata standards and specifications including Dublin Core, Instructional Management Specifications, AICC standards, and the IEEE-LTSC standards. We described the structure and components of learning objects using the CISCO framework. Learning objects includes a set of 7±2 reusable information objects, and they can be aggregated at the level of course, lesson and topic. While the instructional system design model is applicable to development of learning objects, we also should develop these considering the type applicable to different subject areas. There are five types of learning objects: concept, fact, procedure, process, and principle. We hope the discussion in this unit would give you an overview of the world of learning objects, as we have not gone into the practical aspects developing standard compliant learning objects.

19.8 KEYWORDS

AICC: Aviation Industry CBT Committee. An emerging set of standards The AICC sets guidelines in the development, delivery, and evaluation of e-learning programs. These guidelines are developed specifically for the aviation industry, but are being widely adopted in a variety of other industries.

Authoring tool: Software application used to produce interactive learning materials that bring together all components of a course, such as text presentation, graphics, tracking, and links.

Courseware: Software designed specifically for use in a classroom or other educational setting, containing instructional material, educational software, or audiovisual materials. "Courseware" is a term used to describe software resources which are used for Computer-Assisted Learning (CAL). to mediate or support a course or module.

Learning Content Management System (LCMS): A web-based administration program that facilitates the creation, storage and delivery of unique learning objects, as well the management of students, rosters, and assessments.

Learning Management System (LMS): A program that manages the administration of training. Typically includes functionality for course catalogs, launching courses, registering students, tracking student progress and assessments.

Metadata: Information about content that allows it to be stored in and retrieved from a database.

Reusable information objects (RIO): A collection of content, practice, and assessment items based on a learning objective.

Reusable learning objects (RLO): Information, based on RIOs, overviews, summaries, and assessments that supports a specific learning objective.

SCORM: The Sharable Content Object Reference Model (SCORM) integrates a set of related technical standards, specifications, and guidelines designed to meet SCORM's high-level requirements—accessible, interoperable, durable, and reusable content and systems. It is a series of e-learning standards that specify ways to catalog, launch and track course objects

19.9 REFERENCES AND FURTHER READINGS

- Barritt, C., & Alderman, F.J., Jr. (2004). *Creating a Reusable Learning Object Strategy*, San Francisco: Pfeiffer
- Cisco Systems (199). Reusable Information Object Strategy: Definition, Creation Overview, and Guidelines Version 3, 1999 http://www.cisco.com/warp/public/779/ibs/solutions/learning/whitepapers/el_cisco_rio.pdf
- Cisco Systems (2003). Reusable Information Object Strategy: Definition, Creation Overview, and Guidelines Version 4.5 at http://www.e-novalia.com/materiales/RLOW__07_03.pdf
- Friesen, N. (2003). Three Objections to Learning Objects and E-learning Standards. Available online at <http://learningspaces.org/n/papers/objections.html>
- Harman, K., & Koohang, A. Eds. (2007). *Learning Objects and Instructional Design*, Santa Rosa: Information Science Press.
- Harman, K., & Koohang, A. Eds. (2007). *Learning Objects: Standards, Metadata, Repositories & LCMS*, Santa Rosa: Information Science Press.
- L'Allier, J. J. (1998). *NETg's precision skilling: The linking of occupational skills descriptors to training interventions* [On-line]. Available: <http://www.netg.com/research/pskillpaper.htm>
- Littlejohn, A. Ed. (2003). *Reusing Online Resources: A sustainable approach to e-learning*, London: Kogan Page
- McGreal, R (2009). Learning Objects: A Practical Definition. Available at http://itdl.org/Journal/Sep_04/article02.htm
- McGreal, R. Ed. (2004). *Online Education Using Learning Objects*, Abingdon: RoutledgeFalmer
- Rogers, P., Howard, C.(Ed.)(2007) *Encyclopedia of Distance Learning*(2nd Ed.). Google Books. Available online at http://books.google.com/books?id=sC9Le3jIwzIC&printsec=frontcover&source=gbs_navlinks_s
- Smith, R.S. (2004). *Guidelines for Writers of Learning Objects*. The New Media Consortium: Austin, Texas
- Wiley, A.D. (2001). Connecting learning objects to instructional design theory: A definition, a metaphor, and a taxonomy [On-line]. Available at <http://www.elearning-reviews.org/topics/technology/learning-objects/2001-wiley-learning-objects-instructional-design-theory.pdf>
- Wisher, R. (2009). Sharable Content Object Reference Model (SCORM)® 2004 4th Edition: Overview, Version 1 by ADL Initiatives. Retrieved from <http://www.adlnet.gov>

19.10 FEEDBACK TO CHECK YOUR PROGRESS QUESTIONS

Check Your Progress 19.1

- 1) Your definition of learning object should include the characteristics such as reusable, digital, adaptable, interoperable, granular, independent nature of learning resource.
- 2) Your answer may include any five of the listed characteristics such as: usability, adaptability, reusability, contextual neutrality, interactivity, independent, and interoperable.

Check Your Progress 19.2

- 1) Three advantages of learning objects are: it saves financial resources, it saves time and effort to build the LO, and high quality of interactive resource.
- 2) The major objections to learning object strategy are: the definition of LO is too simple to be accepted as such, and learning being contextual, and LOs being context independent their utility is questionable, and since the concept emerged in the Army, it may not be applied in education.

Check Your Progress 19.3

- 1) Five basic Dublin Core metadata elements are: creator, format, language, date and publisher. However there are 10 other elements, and if you have written any of those, you are in correct path.
- 2) In the context of IMS, the competency standard gives specifications for common understanding of competencies as part of career plan as learning pre-requisites or as learning outcomes. The information model in this specification can be used to exchange information between learning systems, content repositories, and other human resource performance systems.
- 3) SCORM is the short form of Sharable Content Object Reference Model. It is an initiative of the Advanced Distributed Learning (ADL) of US Department of Defense. It is a collection of specifications and standards for creation of interoperable, accessible, durable, affordable, and re-usable learning objects.

Check Your Progress 19.4

- 1) The components of RIO are: Content items, Practice items, and Assessment Items.
- 2) The learning objects can be aggregated at the course level, lesson level and topic level.

Check Your Progress 19.5

The five types of Learning Objects are: conceptual, factual, procedural, process-orientated and principle-based. Example of each one is as follows:

Concept	What is an Open University?
Fact	A description about IGNOU as Open University
Procedure	How to log on to the Internet using an ISP
Process	Steps in instructional design model such as ADDIE
Principle	The principles of multimedia design

UNIT 20 LEARNING MANAGEMENT SYSTEMS

Structure

- 20.0 Introduction
- 20.1 Learning Outcomes
- 20.2 Learning Management Systems (LMS)
 - 20.2.1 Features of LMS
 - 20.2.2 Advantages and Disadvantages
- 20.3 Learning Content Management Systems (LCMS)
 - 20.3.1 LCMS Vs LMS: Similarities and Comparison
- 20.4 Criteria for Selecting LMS
- 20.5 Total Cost of Ownership of LMS
- 20.6 Learning Management Systems: Examples
 - 20.6.1 Moodle
 - 20.6.2 ATutor
 - 20.6.3 Other LMSs
- 20.7 Let Us Sum Up
- 20.8 Keywords
- 20.9 References and Further Readings
- 20.10 Feedback to Check Your Progress Questions

20.0 INTRODUCTION

In the Unit 9, we studied that e-Learning is a networked system of learning that uses the power of the web to provide both synchronous and asynchronous more of learning. It can deliver cost-effective, personalized, relevant, interactive learning any time anywhere. E-Learning has the power to transform how students learn in the new world where knowledge is important and change is constant. E-Learning is the continuous assimilation of knowledge and skills by learners, stimulated by synchronous and asynchronous learning events, which are authored, delivered, engaged with, supported, and administered using web technologies.

E-Learning Courses are hosted on web servers and always delivered in a web browser. The delivery of online courses started initially as static web pages plus use of email, discussion groups, etc. with occasional use of online quiz and assignments, etc. It became un-manageable for the teachers and the institutions to keep record of student progress and their works. Students also faced difficulties in keeping record of passwords, and log in methods of different systems. Teachers faced difficulties in content creation and organization, as they required different software and tools. Realizing these problems to use the web as a delivery mechanism for teaching, new software emerged to manage the entire process of student enrollment to student performance testing. The first such software named *eCollege* was reported in 1996, when the University of Colorado used a web-based system to offer online programmes. *Blackboard* (started at Cornell University) and *WebCT* (started at University of British Columbia) emerged in the year 1997. WebCT is now merged with Blackboard, and represents a major share in the proprietary Learning Management System (LMS) market. However, with the emergence of open source LMS such as *Moodle* in 1999; more and more educational institutions are preferring to use open source LMSs. Though

selection of right LMS should be dependent on the needs of the institution and the budget and expertise level available, Moodle is being used by over 4000 institutions in over 203 countries. In this unit, we will discuss the features of LMS and other related technologies to help you understand its use in online learning.

20.1 LEARNING OUTCOMES

After working through this unit, you are expected to be able to:

- *Distinguish* between Learning Management System (LMS) and Learning Content Management System (LCMS);
- *List* the characteristics of a typical LMS;
- *Select* an appropriate LMS for a given teaching learning situation;
- *Describe* the advantages and disadvantages of using LMS; and
- *Discuss* the total cost of ownership of a LMS.

20.2 LEARNING MANAGEMENT SYSTEMS (LMS)

One of the most recent innovations in distance education has been the implementation of course management or learning management systems that allow educators to develop and deliver instruction and learning opportunities in an organized and collaborative manner. These systems can incorporate a wide variety of materials, including text and multimedia resources such as learning objects obtained from various learning repositories. They can offer a variety of assignments that students can complete at a time that is convenient to them working alone or with other students. Learners can collaborate on projects and mentor each other. Instructors can provide timely and constructive feedback. Through the use of course management systems, educators are able to deliver the same quality learning experiences to students who are on campus and students who are many kilometers away.

A Learning Management System (commonly abbreviated as LMS) is a software application for the administration, documentation, tracking, and reporting of learning activities and events. Most LMSs are web-based which facilitate “anytime, anywhere, any pace” access to learning content and administration. Some LMSs can also help us to deliver and manage instructor-led synchronous and asynchronous online teaching. In essence, an LMS is a strategic solution for planning, delivering, and managing most learning events, including online, virtual classroom, and instructor-led courses.

The LMSs are also called Content Management Systems. However, according to Chapman and Hall (2001), they are designed for a much broader purpose and are used to create information portals for organizations and can serve as the foundation for the practice of knowledge management. Generally LMS should be able to do the following (ASTD, 2009):

- centralize and automate administration
- use self-service and self-guided services
- assemble and deliver learning content rapidly
- consolidate training initiatives on a scalable web-based platform
- support portability and standards
- personalize content and enable knowledge reuse.

20.2.1 Features of LMS

Generally LMS consists of a variety of features and Edutools (2009) provides a comparison of both proprietary and open source products based on the features identified by the users. We have listed here some of the basic features of LMS based on Edutools:

Learner Tools

Communication Tools

- Discussion forum is a threaded online text conversation between participants.
- Discussion Management includes all of the accessing and scheduling associated with running a discussion forum.
- File exchange tools allow learners to upload files from their local computers and share these files with instructors or other students in an online course. Note: File attachments to messages are part of Internal Email and Discussion Forums.
- Internal email is electronic mail that can be read or sent from inside an online course.
- Online Notes/Journal enable students to make notes in a personal or private journal. Students can share personal journal entries with their instructor or other students but cannot share private journal entries.
- Real-time chat is a conversation between people over the Internet that involves exchanging messages back and forth at virtually the same time.
- Whiteboard tools include an electronic version of a dry-erase board used by instructors and learners in a virtual classroom (also called a smartboard or electronic whiteboard) and other synchronous services such as application sharing, group browsing, and

Productivity Tools

- Bookmarks allow students to easily return to important pages within their course or outside their course on the web. In some cases bookmarks are for an individual students private use, and in others can be shared with an instructor or amongst a group.
- Calendar/Progress Review tools enable students to document their plans for a course and the associated assignments in a course.
- Searching within a course is a tool that allows users to find course material based on key words.
- Work offline/synchronize is a set of tools that enable students to work offline in their online course and for their work to be synchronized into the course the next time they log-in. Sometimes students can download course content to their local computers and work offline.
- Orientation/Help tools are designed to help students learn how to use the course management system. Typically, these tools are self-paced tutorials, user manuals, and email or telephone helpdesk support.

Student Involvement Tools

- Group Work is the capacity to organize a class into groups and provide group work space that enables the instructor to assign specific tasks or projects.
- Community Networking tools allow students to create social ties, study groups, clubs, or collaborative teams without instructor intervention.
- Student Portfolios are areas where students can showcase their work in a course, display their personal photo, and list demographic information.

Support Tools

Administration Tools

- Authentication is a procedure that works like a lock and key by providing access to software by a user who enters the appropriate user name (login) and password. Authentication also refers to the procedure by which user names and passwords are created and maintained.
- Course authorization tools are used to assign specific access privileges to course content and tools based on specific user roles, e.g. students, instructors, teaching assistants. For example, students can view pages and instructors can author pages.
- Registration tools are used to add students to and drop students from an online course. Administrators and/or instructors use registration tools but students also use them when self-registration is available. Students can also be added to or dropped from the course.
- Hosted Services means that the product provider offers the course management system on a server at their location so the institution does not provide any hardware.

Course Delivery Tools

- Test types indicate which types of questions the software supports.
- Automated testing management includes the control of when and where tests may be taken and under what conditions.
- Automated testing support includes system services for importing and exporting tests and test banks as well as statistical analysis of test results.
- Online marking tools enable instructors and assistants to evaluate and mark student work while online.
- Online gradebook includes supports for keeping track of student progress and work online in support of assigning course grades.
- Course management tools allow instructors to control the progression of an online class through the course material.
- Student Tracking is the ability to track the usage of course materials by students, and to perform additional analysis and reporting both of aggregate and individual usage.

Content Development Tools

- Accessibility compliance means meeting the standards that allow people with disabilities to access information online. For example, the blind use a device called a screen reader to read the screen but Web pages need to be designed so that screen readers can navigate it easily.
- The product provider self-reports that the software complies with the WAI WCAG 1.0 AAA guidelines.
- Course templates are tools that help instructors create the initial structure for an online course.
- Customized Look and Feel is the ability to change the graphics and how a course looks. This also includes the ability to institutionally brand courses.
- Instructional design tools help instructors creating learning sequences, for example, with lesson templates or wizards.
- Instructional standards compliance concerns how well a product conforms to standards for sharing instructional materials with other online learning systems and other factors that may affect the decision whether to switch from this product to another.

- Content Authoring and integration in text, audio, video, graphics, animation and multimedia.
- Provision for student and instructor blogs and wikis.

20.2.2 Strengths and Limitations

Strengths

The LMS has the following strengths:

- It provides a centralized learning environment to provide consistency in teaching and student assessment;
- It is available 24X7 to the learners, and multiple students can access the course content simultaneously;
- It provides simple, easy to use templates to help the teacher to develop software related skills easily;
- It provides tracking of the students to know how they are performing, how much time they have been spending in the course pages and activities, etc.;
- It saves teacher time to provide more quality time in class, as they can delegate some routine tasks to be done after the class using the LMS;
- It can provide collaborative group learning opportunity to the students;
- It gives one stop solution to the learners as all related activities are done through the LMS, and the learners can depend on this as a guide to search and find information;

Limitations

Many LMSs provide templates for the creation of online course content. Templates allow teachers to design and create courses easily and quickly in a familiar environment without the need for much training. Templates are acceptable where discussion and debate are central to understanding and knowledge building. However, they are rather insufficient when there is a need to develop knowledge of subject matter such as mathematics and science, which require illustration and demonstration.

Most modern LMSs have the capability to collect, organize and report data on learners' activities. Tracking may include data on time spent on a learning activity, when it was started and completed, and number of attempts at an assessment item. But, tracking eliminates a key benefit of LMS, 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. Some learners who know that all their learning activities are being tracked and recorded, may feel less comfortable experimenting, taking chances, and pushing the limits of their knowledge. It is possible that instead of learning from their own mistakes (which is quite effective way to learn), they will try to avoid making any mistakes at all.

As users become more knowledgeable and comfortable with the use of LMS, they will demand many advanced features and functionality, including support for wireless devices, better collaborative learning tools, and better content management capabilities. The next-generation of LMSs may have better functionalities, customizability, flexibility, interoperability, and scalability. Moreover, after users move beyond the thrills of the new technology, they will focus their attention on the educational functions of the tools. This will lead to the development of robust LMSs that are guided by pedagogical considerations and not by what the developers or the tools can do.

20.3 LEARNING CONTENT MANAGEMENT SYSTEMS (LCMS)

A learning content management system (LCMS) is a related technology to the learning management system. It focuses on the development, management and publishing of the content that will typically be delivered via an LMS. An LCMS is a multi-user environment where developers may create, store, **reuse**, manage, and deliver digital learning objects from a central object repository. The LMS cannot create and manipulate courses; it cannot reuse the content of one course to build another. The LCMS, however, can create, manage and deliver not only training modules but also manage and edit all the individual pieces that make up a training. LCMS applications allow users to create, import, manage, search for and reuse small digital learning objects. These objects may include media files developed in other authoring tools, assessment items, simulations, text, graphics. An LCMS manages the process of creating, editing, storing and delivering e-learning content.

20.3.1 LCMS Vs LMS: Similarities and Comparison

Some systems have tools to deliver and manage instructor-led synchronous and asynchronous online training based on learning object methodology. These systems are called Learning Content Management Systems or LCMSs. LCMSs provide tools for authoring and reusing content as well as virtual spaces for student interaction (such as discussion forums, live chat rooms and live web-conferences). Despite this distinction, the term LMS is often used to refer to both an LMS and an LCMS, although the LCMS is a more recent development of the LMS.

In essence, an LMS is software for planning, delivering, and managing learning events within an organization, including online, virtual classroom, and instructor-led courses. For example, an LMS can enable entities to align learning initiatives with strategic goals. The focus of an LMS is to manage students, keeping track of their progress and performance across all types of learning activities. It performs administrative tasks, such as reporting to teachers but isn't used to create course content.

In contrast, an LCMS is software for managing learning content across an organization's various training development areas. It provides developers, authors, instructional designers, and subject matter experts the means to create and reuse ELearning content and reduce duplicated development efforts.

Rather than developing entire courses and adapting them to multiple audiences, an LCMS provides the ability for single course instances to be modified and republished for various audiences maintaining versions and history. The objects stored in the centralized repository can be made available to course developers and content experts throughout an organization for potential reuse. This eliminates duplicate development efforts and allows for the rapid assembly of customized content. Table 20.1 gives a brief summary of the comparative features of LMS and LCMS.

Table 20.1: LMS vs. LCMS

Features	Learning Management Systems	Learning Content Management Systems
Provides primary management of -	Learners	Learning content
Management of classroom, instructor-led training	Yes	No
Performance reporting of training results	Primary focus	Secondary focus
Learner collaboration	Yes	Yes
Keeping learner profile data	Yes	No
Sharing learner data with an ERP system	Yes	No
Event Scheduling	Yes	No
Competency mapping – skill gap analysis	Yes	Yes (in some cases)
Content Creation capabilities	Yes (in some cases)	Yes
Organizing reusable content	No	Yes
Creation of test questions and test administration	Yes	Yes
Dynamic pre-testing and adaptive learning	No	Yes
Workflow tools to manage the content development process	No	Yes
Delivery of content by providing navigational controls and learner interface	No	Yes

Check Your Progress 20.1

Notes: a) Write your answers in the space given below.

b) Compare your answers with those given at the end of this unit.

1) What are the advantages of LMS?

.....

.....

.....

.....

.....

.....

.....

2) What is the principal difference between LMS and LCMS?

.....

.....

.....

.....

.....

.....

.....

20.4 CRITERIA FOR SELECTING LMS

Selecting the right online-learning management system and achieving a successful implementation is a big challenge. This is particularly true for organizations which have historically relied on conventional classroom-based approaches to learning and teaching. Evaluating the many associated issues regarding selection of LMS and ensuring that the organizational infrastructure is able to support it is a major challenge.

Every institution will have different requirements, and therefore, one LMS may not be useful for all organizations, though there is always a bandwagon effect. People tend to buy or use a particular LMS, because someone else have used it, and has recommended the same. Though it may be a good approach to start with, it is not a good idea to implement the strategy for an institutional decision making process. We recommend that you take a systemic view while deciding on the use of LMS institution-wide. The steps to be followed are as follows:

Step 1: Form a core selection team in your institution by including teachers who are knowledgeable about LMS, and/or have some experience of using the same. If no internal expertise is available, it is also a good idea to have people from outside the institution to be member of the selection group. However, their number may not be more than the internal people, and no one in the group should have any conflict of interest.

Step 2: Decide on the major goal of the institution to use LMS. It is essential that you are clear about why the institution wants to use LMS, and why it wants to go ahead with this approach. This may not be a question in many institutions to address, but it is better to have clarity of this. One institution may want to improve teaching and learning by using LMS, other may want to increase its reach to more students. Both these goals would have different implications; one may require the LMS to be robust to handle more concurrent students, while the other may not require this.

Step 3: List a set of criteria to evaluate the LMS. These criteria will be your first level of evaluation for assessing the LMS in the context of your organization. Some of these criteria may be: Cost of Ownership, Maintainability and Ease of Maintenance, Usability, Ease of Use, and User documentation, User Adoption/ Vendor Profile, Standards Compliancy, Learning Object Metadata Integration, Scalability, Security, Hardware and Software Considerations, Multilingual Support, etc.

Step 4: List the requirements for the LMS in terms of the *features* that you would like to have. This will be your second level of criteria for selecting LMS. Categorize these requirements as 'must have', 'should have' and 'nice to have'. For example, you may not want an in-built synchronous video conference option in the LMS, and you may like to put it as 'nice to have', while, you want a variety of quizzes to be used, and you want this as a 'should have' that you may like to compromise on different types of questions only; and then you may like to have a feature like discussion forum as 'must have', on which you will not compromise at all. The requirement analysis and specification is unique to each institution, but as different department will have different needs, it is important to involve all stakeholders. However, it may be noted that it would be impossible to find the right LMS with all the features that you may like to have. So, you need to take decisions using some criteria.

Step 5: Review the LMS options available by identifying candidate options and visiting their website to prepare a chart showing availability of different features as listed in your requirement document. Short list some of the LMS vendors.

Step 6: Send Request for Proposals (RFP) to these identified vendors to give their quotes for deployment of the LMS with hosting option and without hosting option; for direct one time purchase and for per user license basis; for content conversion and for maintenance of the system.

Step 7: Review the proposals received, and select 2-3 vendors. Ask for demonstrations by the selected vendors. Take decision.

Criteria for Selecting Learning Management System

You may like to include some or all of the following questions in your criteria:

Cost of Ownership

- 1) What are the costs for licensing, software, hardware and custom development requirements?
- 2) How fast can you be up and running?
- 3) What level of expertise is required?
- 4) What kind of support and assistance are available?

Maintainability and Ease of Maintenance

- 5) How many valuable resource hours will this take to administer and maintain at the server level, and at the program level?
- 6) How granular and distributed is the administration (the more granular the better)?
- 7) Are all of the data processes automated and will they integrate easily with your other systems?
- 8) Does the program run on a server platform on which your staff already has excellent expertise?

Usability, Ease of Use, and User documentation

- 9) How available is documentation, how-to guides, training and online help?
- 10) How responsiveness will support be?
- 11) Will the program require lots of training or is it fairly intuitive to use?
- 12) How long will it take faculty to set up their courses at a minimal level?

User Adoption/ Vendor Profile

- 13) Will the vendor be around tomorrow? How much market share?
- 14) If the product is Open-Sourced, is there a strong development community associated with the program?
- 15) Are comparable institutions currently utilizing the program?

Openness

Note: This criterion is applicable to Open-Sourced LMS's only.

- 16) How open is the source code?
- 17) Is it written in a modular format that is designed for easy modification and new, custom modules?
- 18) Are there clear code specifications for writing new modules?

Standards Compliance

- 19) Does the LMS adhere to specifications like SCORM, IMS, OKI, AICC?
- 20) Can the LMS import and manage content and courseware that complies with standards regardless of the authoring system that produced it?
- 21) Is XML support available?

Integration Capacity

- 22) Has the application been integrated with other systems?
- 23) Does the solution allow for ready integration with other systems?

Learning Object Metadata Integration

- 24) How available is compatible content?
- 25) What is the capacity to integrate with existing and newly created learning objects?

Reliability & Effectiveness

- 26) Is the solution reliable? How well will this program help an average group of faculty deliver their materials online?

Scalability

- 27) Is the program suitable for both small and large installations?
- 28) How easily does the solution allow for growth of users, content, functionality?

Security

- 29) Will it handle security or authentication schemas?
- 30) Are there tools for digital right management (DRM)?
- 31) Are the provisions for privacy issues?

Hardware and Software Considerations

- 32) Does it support multiple Operating System platforms (including Open-Sourced OS)? Linux? Windows?
- 33) What are the client browser requirements?
- 34) What are the database requirements?
- 35) What additional server software is required?
- 36) What are the hardware specifications?

Multilingual Support

- 37) Does the system support additional languages?

Check List for Features in Learning Management System

You may like to include some of the features for consideration in the LMS for your organization. We present to you a detailed checklist for your use in Table 20.2.

Table 20.2: List of Features in LMS

Features	Yes/No
Administration	
Manage user registrations	
Set curricula, chart certification paths	
Administer internal budgets, user payments, and charge-backs.	
Create standard and customized reports on individual and group performance. Reports should be scalable to include the entire workforce	
Print Certificates	
Build schedules for learners, instructors, and classrooms	
Security	
Encryption (encodes and decodes messages). Ability to accommodate privacy. Note that full certificate-SSL (a protocol that encrypts a single TCP session) is likely to be too slow for this purpose	
Authentication (verifies the identity of a user). Username & password with forgotten password routine	
Access	
Individual/Group Login and Password	
Assignable Privileges. Manage user profiles, define roles. Assign tutors.	
Browser accessible	
Course Authorization – Instructors approve enrolment.	
Registration Integration - Registration, Prerequisite Screening, Cancel Notification	
Integration with other systems	
Integration with HR Systems.	
Integration with CRM systems. Student listing. Maintain student information	
Course Design, Development and Integration	
Customizable look and feel	
Support classroom and virtual courses	
Course templates	
Use of and access to learning objects	
Web-based authoring	
Support multimedia types	
Accessibility compliance	
Instructional design tools	
Curriculum management	
Easy Navigation/linking	
Easy Course structuring	
Extensible Architecture	
Support style sheets	
Course Monitoring	
Course Listing/Catalogue	
Course Descriptions	
Schedules and Availability Control	
Course Usage Tracking	
Assessment Design	
Create test questions and facilitate test administration	
Automated Testing and Scoring	
Course Path Maintenance - Path lists and diagrams	
Competency Mapping/Skill Gap Analysis	
Self-assessment	
Online Collaboration and Communications	
Community learning or collaboration components that support communication.	
E-mail - Ability to integrate with emails sent from regular POP mail accounts (from learners not logged in real-time)	
Chat rooms	
Online support / help desk	
File exchange	
Online journals	
Notes	
Whiteboard	
Discussion groups/forums	
Productivity Tools	
Bookmarks	
Calendar/Progress Review	
Orientation/Help	
Search	
Work offline/Synchronize	

20.5 TOTAL COST OF OWNERSHIP OF LMS

Usually, institutions consider changing their LMS as the renewal date of their license expires or when they have been informed that the current version of their LMS will no longer be supported. Thus, institutions consider their options and may decide to switch from proprietary software such as Blackboard/WebCT to open-source software such as ATutor or Moodle. A few of the reasons for such switch are as given below:

- 1) The cost of the annual license for proprietary software keeps rising each year, while the cost of obtaining many open-source LCMS and LMS is negligible. It is estimated that proprietary licensing fees may represent 20-25 percent of the total cost of software ownership. Note, however, that the cost of maintaining proprietary or open-source software may be about the same.
- 2) Since users do not have access to the source code that supports proprietary software, they cannot make add features to it. They cannot correct software bugs immediately. They can forward their request to the developer, who may or may not make the suggested changes. Revisions can take considerable time and the requestor may be charged for the service.
- 3) Proprietary software may not be kept current. It may be designed to address the basic needs of some institutions, but not the more advanced needs of other institutions. Note, however, that open-source software depends upon an active community of software users to keep the software current.
- 4) The license agreement that accompanies proprietary software may constrain how the software is distributed. If institutions want to distribute the software to students who have limited financial resources, the proprietary license agreement may prohibit this distribution unless an additional fee is paid. Thus, students in certain socio-economic areas may not have the financial capacity to obtain proprietary software. The institutional purchase of this type of software may increase the digital divide - the gap between those who have access and can use information technology and those who cannot. This is a significant issue for many developing countries.
- 5) Decision makers should consider the cost of maintenance and support when deciding to move to an open-source environment. Personnel must be hired to authorize access to the software, create course files, monitor the efficiency of the software, perform backups, and help people use the software.

Open-source software may first appear to be less expensive than proprietary software. However over time, “free” open-source software may be more costly if it is not robust and if it does not have the features students and instructors need. It must also be flexible, reliable, capable, and scalable. A software is robust if it can handle numerous and varied transactions at the same time.

Check Your Progress 20.2

Notes: a) Write your answers in the space given below.

b) Compare your answers with those given at the end of this unit.

- 1) List at least five criteria that you would use in evaluating a LMS.

.....

.....

.....

.....

.....

- 2) Explain the meaning of Total Const of Ownership of LMS.

.....

.....

.....

.....

.....

20.6 LEARNING MANAGEMENT SYSTEMS: EXAMPLES

Educators can choose from several hundred CMS and LMS products. Below are examples of two well-known open-source course delivery platforms.

- **ATutor** is a web-based learning content management system that was initially developed by the Adaptive Technology Resource Centre, University of Toronto to offer maximum flexibility regarding accessibility and adaptability of online courses. It can be accessed by learners with disabilities who have access to assistive technologies.
- **Moodle** is a LMS that is guided by the social constructivist learning philosophy, i.e., learners construct new knowledge as they interact with their environment; when working with others, they can develop a shared meaning. The software comprises various modules that include assignments, chats, forums, glossaries, lessons, journals, quizzes, and resources.

20.6.1 Moodle

Website: <http://moodle.org>

Moodle is designed to support a style of learning called Social Constructionism. This style of learning is interactive. The social constructionist philosophy believes that people learn best when they interact with the learning material, construct new material for others, and interact with other students about the material. The difference between a traditional class and the social constructionist philosophy is the difference between a

lecture and a discussion. Moodle does not require you to use the social constructionist method for your courses. However, it best supports this method.

Moodle is primarily developed in Linux using Apache, MySQL and PHP (also sometimes known as the LAMP platform). It is also regularly tested with Windows XP/2000/2003 (WAMP), Solaris 10 (Sparc and x64), Mac OS X and Netware 6 operating systems. Support for PostgreSQL, Oracle and Microsoft SQL Server is also available.

The requirements for Moodle are as follows:

Hardware

- Disk space: 160MB free (min). You will require more free space to store your teaching materials.
- Memory: 256MB (min), 1GB (recommended). The general rule of thumb is that Moodle can support 50 *concurrent* users for every 1GB of RAM, but this will vary depending on your specific hardware and software combination.
 - o This includes hosting limits of PHP or MySQL on a hosting service.
 - o The capacity can limit the number of users your Moodle site can handle.

Software

- Web server software. Most sites use Apache as the web server software. Moodle works fine under any web server that supports PHP, such as IIS on Windows platforms.
- PHP scripting language. (Please note that there have been issues installing Moodle with PHP-Accelerator). There are currently two versions (or branches) of PHP available: PHP4 and PHP5. See the PHP Moodle version requirements here [PHP settings by Moodle version](#).

If you want to run Moodle on your own computer, please see Installing Apache, MySQL and PHP for step-by-step instructions for installation on most popular platforms.

Moodle enables you to add five kinds of static course material:

- Text pages
- Web pages
- Links to anything on the Web
- A view into one of the course's directories
- A label that displays any text or image

However, Moodle enables you to add six types of **interactive** course materials:

- Assignment (uploading files to be reviewed by the teacher)
- Choice (a single question)
- Journal (an online journal)
- Lesson (a conditional, branching activity)
- Quiz (an online test)
- Survey (with results available to the teacher and/or students)

Moodle also offers five kinds of **collaborative** activities where students collaborate with each other:

- Chat (live online chat between students)
- Forum (you can have none or several online forums for each course)
- Glossary (students and/or teachers can contribute terms to site-wide glossaries)
- Wiki (a familiar tool for collaboration)
- Workshop (For peer review and feedback of assignments that the students upload)

So far, we have listed five kinds of static course materials, six kinds of interactive course materials and five kinds of collaborative course materials. In addition, some of Moodle's add-on modules add more types of interaction. For example, one add-on module enables students and teachers to schedule appointments with each other. For more about Moodle check the website

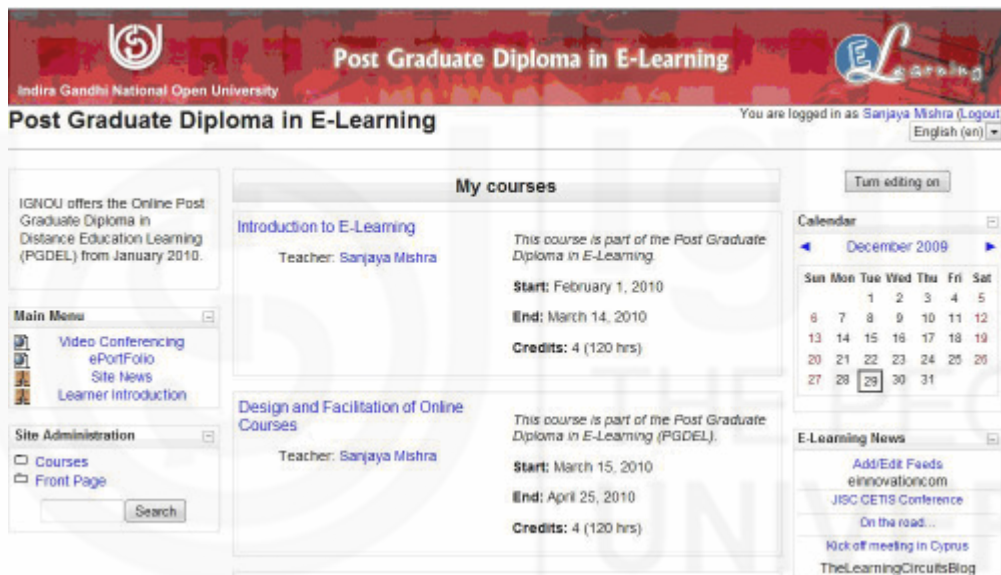


Figure 20.1: A Typical Moodle Website Example

20.6.2 ATutor

Website: <http://www.atutor.ca>

ATutor is an Open Source Web-based Learning Content Management System (LCMS/LMS) and social networking environment designed with accessibility and adaptability in mind. Administrators can install or update ATutor in minutes, develop custom themes to give ATutor a new look, and easily extend its functionality with feature modules. Educators can quickly assemble, package, and redistribute Web-based instructional content, easily import prepackaged content, and conduct their courses online. Students learn in an adaptive, social learning environment.

ATutor requires the following to run in a web server:

- HTTP Web Server is required. (We highly recommend using Apache)
- PHP version 4.3.0+ for ATutor 1.6.2 and earlier. ATutor 1.6.3+ requires PHP 5.0.2+. Zlib, MySQL, MBString must be enabled (Curl must also be enabled for ATutor Social).
- MySQL - As of ATutor 1.6, MySQL 4.1.10+ is required.

For the learner end ATutor makes use of many new HTML features that are only supported in current Web browsers. Though ATutor will function effectively in older or text only browsers, it strongly recommends updating your browser to a more recent version. Current versions of FireFox 2+, Opera 8+, and Microsoft Internet Explorer 7+ work well with ATutor.

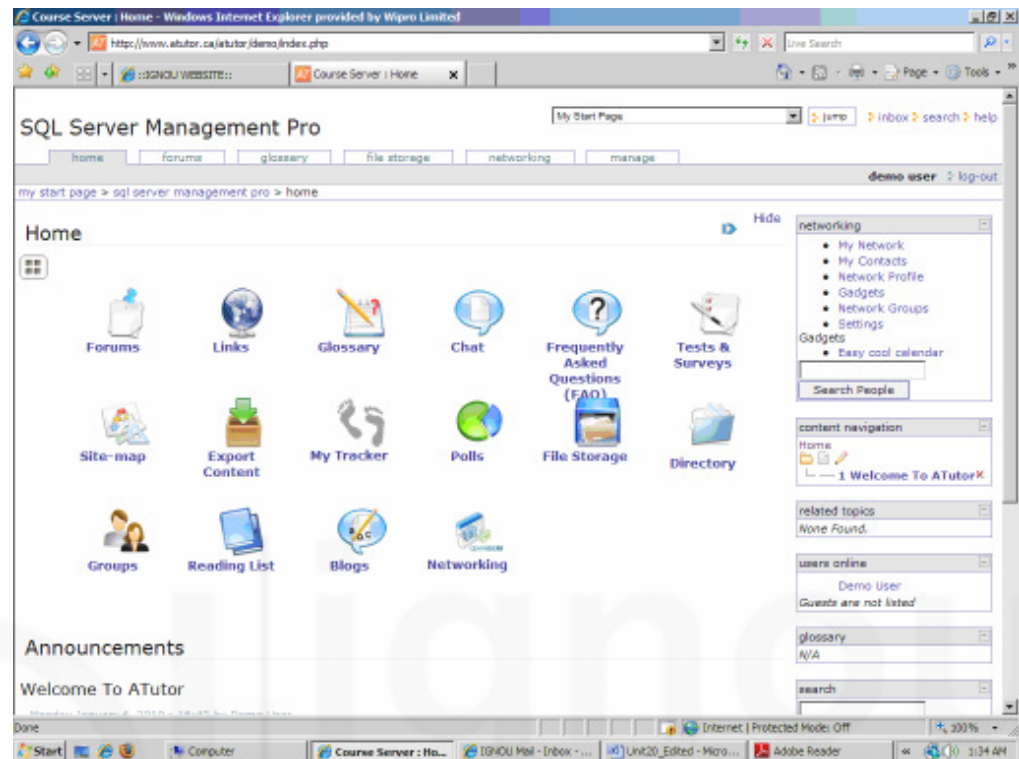


Figure 20.2: ATutor Website Example

Important ATutor features are as follows:

For Learners

- **Social Networking:** Teacher can turn on social networking within courses and create course networking groups to enhance class interaction.
- **Security:** Login passwords are encrypted. Forgotten passwords must be reset, rather than retrieved by email, removing the possibility they might be intercepted when being sent over the Internet.
- **My Courses:** Instructors and students can manage the ATutor courses they teach and/or are enrolled in.
- **Inbox/Messaging:** All users on an ATutor system have an Inbox, through which they can send and receive private messages from other users. Messages sent are saved to 'Sent' Messages, which remain for a set period before being deleted. Messages can be exported and saved externally.
- **Student Profile:** Students can add personal information about themselves for other to see, and include a profile picture, which is also displayed with forum posts.
- **Adaptive Navigation:** Learners can move through ATutor content using global, hierarchical, or sequential navigation tools.
- **Work Groups:** Learners can collaborate with others on course projects, communicate as a group through the forums share resources using the File Storage, and work together authoring project documents.

- **File Storage:** All users on an ATutor system have their own file storage utility. File storage areas can also be shared across groups, or an entire course. Version control can be enabled to keep track of drafts or changes to documents.
- **Group Blog:** Each group has access to their own blog, to which they can post public messages or private messages.
- **Feedback:** Following an action feedback is given on the status of the operation. This could be a success message, warnings to consider, or errors to fix.
- **Preference Settings:** Learners can control ATutor features and the theme ATutor is presented in.
- **Communication Tools:** Learners can communicate with others using ATutor's private mail, the discussion forums, the chat rooms, or the "User's Online" tool. Students can communicate with those in other courses through a community forum. Subscribe to forums or topic threads to have forum messages sent by email.
- **Content Tracker:** Learners can keep track of the content pages they have visited.
- **Test Manager:** Learners can take tests, review test results, and keep track of their scores. Course Guests can take practice tests.
- **Glossary:** Words and phrases added to the glossary by the instructor, can be accessed from terms embedded within content pages, or viewed alphabetically in their entirety using the Glossary tool.
- **Links Database:** Each course, and groups within courses, has a tool for collecting links to Web-based information. Both students and instructors can add links.
- **Course Search:** A search engine allows learners to search course content. Search for courses in the course catalogue.

For Teachers

- **Instructor ATutor Handbook:** A link to the full Handbook is available on every screen.
- **Guest Access to Courses:** Guests can be granted access to private courses. Guests can view, but not post content to a course.
- **SCORM Run-Time Environment & SCO Manager:** Add prepackaged, interactive, interoperable, content to your courses with support for SCORM 1.2.
- **Course Tool Preferences:** Instructors can choose from the available course tools and menu modules, selecting only those that are used in a particular course. Optionally display tools in the main navigation bar, or link them into the course home page for quick access.
- **Course Manage Page:** All ATutor tools can be accessed quickly from a central course Manage Page.
- **Content Usage:** Individual usage statistics can be reviewed to identify gaps in content coverage and the learning tendencies of each learner.
- **Work Groups Manager:** Instructors can manually create, or automatically generate work groups for a variety of purposes.
- **Course Tools:** Instructors have access to all the learning tools that are available to learners.

- **File Storage:** The File Storage utility can be used to store private files, files to be shared with course members or group members, or used as a place to collect assignment submissions.
- **Assignment Drop Box:** Extending the File Storage, instructors can create file folders for collecting assignment submissions. A collection of assignments can be zipped together and downloaded.
- **Content Editor:** Instructors can create content in HTML or plain text. This content can be imported from a local editor, or edited directly online. Release dates can be set to control when content is viewable to learners.
- **Visual Editor:** A JavaScript based WYSIWYG editor is available as an extension of the Content Editor so content creators can format course materials without knowing any HTML.
- **Interoperable Content:** Instructors can export or import content from or to ATutor as IMS/SCORM conformant Content Packages that can be viewed offline in the accompanying viewer, or imported into ATutor or another conformant e-learning system. Entire courses, or individual course units can be packaged for viewing or redistribution.
- **Reading List:** Instructors can gather a list of resources (books, papers, urls etc.) related to topics in a course, and create a Reading List based on those resources.
- **Learning Objects Repository:** Search the TILE learning objects repository for course related materials. Import or export content from or to ATutor.
- **Backup Manager:** The entire content and structure of a course can be backed up and stored on the ATutor server, or downloaded and saved to your local computer. Create a copy of a course as a master for future sessions, or move a course to a new location.
- **News & Announcements:** Instructors can post messages to the course Home Page to guide learners through the course. News can be used for weekly introductions, announcing important dates, or posting critical information.
- **File Manager:** Instructors can upload and manage course related files. Directories can be created.
- **Test Manager:** Instructors can create tests with multiple choice, true/false, Likert, ordering, matching, drag and drop, and a number of open ended question types. M/C, multi-select M/C, ordering, matching, and T/F questions are marked automatically. Self-marking tests can be created to provide students with instant feedback. Create surveys and link them to the course home page. Select from a pool of questions to generate random question quizzes. Add questions to a Question Database, then select questions from the database to assemble a test or quiz.
- **Polls:** Instructors can create one question polls to quickly gather student opinions.
- **Forums:** Instructors can create and manage multiple forums for each of their courses. Messages can be edited, deleted, locked from reading and/or replying, and "stuck" to the top of a thread list if a message is important. Administrators can create forums shared across multiple courses. Subscribe to forums, or to topic threads to have messages sent by email.

- **Course Email:** Instructors can send bulk email to course members, assistants, or both.
- **Course Properties:** Instructors can view course login statistics, edit course properties, and send course-wide email messages. A default display language can be set for each course. Assign a course as public, protected, or private, or hide a course while it is being developed.
- **Enrollment Manager:** Instructors may import or export an enrollment list for staff keeping. Create an enrollment list online to add new students to a course. Automatically generate login names and passwords for students and send them by email when a student is enrolled in a course. Assign students as Alumni so they can participate in discussions for future course sessions.
- **Privileges:** Through the Enrollment Manager, instructors can assign students access to various instructor tools, creating teaching assistants or co-instructors.

For Administrators

- **Module Manager:** Administrators can install modules, enable and disable them, define a default module and menu configuration for new courses.
- **Administrator's Home Page:** All administrator tools can be accessed quickly from a central Administrator Home Page.
- **Patcher Module:** Administrators can install patches to keep their ATutor system up-to-date, and secure.
- **Administrator ATutor Handbook:** Administrator documentation is linked from each section of the handbook to the screen ATutor it refers to.
- **Multiple Administrators:** Create multiple administrator accounts assigning specific privileges to each.
- **Pretty URLs:** Administrators can turn on Pretty URL to have URLs rewritten in a more readable form. When turned on, public courses in ATutor can be indexed by search engines.
- **Master Student List:** Require newly created student accounts to be authenticated against a custom imported student ID/PIN paired list.
- **Themes Manager:** Easily create a custom version of ATutor by modifying or creating a theme. Assign themes to categories of courses.
- **Automated Installer and Upgrade:** A fast and easy way to install or upgrade ATutor!
- **General Statistics:** View system usage statistics.
- **Secure Course Content:** Secure course content directory to prevent unauthorized access to course files.
- **Instructor Request:** Review requesting instructors' personal information, and assign instructor status so they may create courses.
- **User Manager:** Users on a system can be sorted, personal information can be viewed, and access privileges can be modified.
- **Enrollment Manager:** Administrators have all the same tools for managing course enrolments as instructors do, with the ability to manage students in any course.

- **Course Manager:** Much like the User Manager, courses on a system can be sorted, their properties modified, and their instructors managed. Create new courses and assign an instructor. Use course backups to generate initial content for a new course. Create shared forums for select courses, or create a community forum for all courses.
- **Backup Manager:** Generate backups of courses to create master copies. Download backups for safe keeping or to move courses to another ATutor server.
- **Cron Utility:** Optionally schedule scripts to run at specific times. Use the Cron Utility to run the Mail Queue every few minutes. Use cron to generate statistics, create a system backup, or to send system reminders, etc.
- **Course Categories:** The ATutor course browser includes a course category browser, so courses can be sorted into a custom defined set of categories, perhaps by department or topic or level. Themes can be assigned to course categories so all courses within a category look the same.
- **Language Manager:** Import language packs directly into ATutor. Once imported, edit languages as needed. Create an ATutor Language Pack by exporting the language from your ATutor system. Courses can display multiple languages at the same time.

20.6.3 Other LMSs

Examples of other notable learning management systems are:

- Blackboard Learning System (<http://www.blackboard.com/>)
- Claroline (<http://www.claroline.net/>)
- ILIAS (<http://www.ilias.de/docu/>)
- Sakai Project (<http://sakaiproject.org/>)

20.7 LET US SUM UP

Learning management systems (LMSs) are application software used on the web that comprises a suite of tools for learning and teaching online. Some of the widely known LMSs are: Moodle, ATutor, WebCT, Blackboard. Most LMSs have tools for creating content, organizing them and delivering online. LMSs also provide tools for communication among learners and also tracking and reporting their progress. An important limitation of LMSs is their tendency to emulate the conventional face-to-face, classroom-based learning and teaching process. The selection of LMS is a complex task and normally depends on strategic planning, budget, technological readiness and value systems of an organization. In this unit, we discussed about how you should select LMS for your organizations following a two step criteria to list basic requirements and features and then decide on the appropriate LMS. We also discussed the concept of total cost of ownership of LMS. In fact, the using open source LMS such as Moodle and ATutor has become popular, as they can be hosted in your institution server, and you do not need to pay any license fee. However, they require considerable institutional effort to maintain the system. On the other hand there are also proprietary LMS such as Blackboard and others that allow you to host a course on their server on payment of fees. They even allow you to host the LMS in your own server on payment of fees which is mainly per user based. We also highlighted the features of Moodle and ATutor to help you understand about the features of

these LMSs. However, we suggest you to visit the website of different LMS to see the demos, documentation. Some even provide you to have your used account to create and test the software.

20.8 KEYWORDS

Asynchronous Learning: Here, teacher and learners, interact with each other, always with some time delay like in email or discussion forum. Here, interaction between sender and receiver can never happen in real time. Asynchronous learning happens when the learner (and not the teacher) wants. Hence, asynchronous learning is basically, anywhere, anytime, online learning and thus, more students centric.

Learning Content Management System: is a software application similar to that of learning management system, but they have additional features to create and manage content as learning objects.

Learning Management System: is a software application for the administration, documentation, tracking, and reporting of training programs, classroom and online events, e-learning programs, and training content

Synchronous Learning: In this type of learning events, teacher and learners, may be separated by geographic distance but they do interact with each other in real time, with no perceptible time delay. This interaction may be only audio like in telephonic talk or audio-visual like in virtual class using instant messaging technologies. The learner can ask the teacher a clarification to difficulties. The teacher can ask the virtual class whether everyone understands a concept just explained. *Synchronous learning happens at fixed time.* Hence, they must be scheduled well in advance, so that majority of learners can participate.

20.9 REFERENCES AND FURTHER READINGS

- ASTD (2009). Field Guide to learning Management Systems, Retrieved from the WWW at <http://www.astd.org/LC/LMSfieldguide.htm> (accessed On 12/09/2009)
- Brandon-Hall (2009). LMS and LCMS Demystified, Retrieved from the WWW at http://www.brandon-hall.com/free_resources/lms_and_lcms.shtml (accessed on 12/09/2009)
- Buchner, A. (2008). *Moodle Administration: An administrator's guide to configuring, securing, customizing, and extending*, PACKT Publishing (<https://www.packtpub.com/>)
- Chapman, B., & Hall, B. (2001). *Learning Content Management Systems*, Sunnyvale, CA: Brandon-Hall
- Cole, J., & Foster, H. (2008). *Using Moodle, Ed 2*, Sebastopol: O'Reilly Media (Also freely available at http://docs.moodle.org/en/Using_Moodle_book for Download and use, share and modify under a Creative Commons Attribution-NonCommercial-ShareAlike 2.0 License)
- EduTools. (2009). CMS: Feature List. Retrieved from the WWW at http://edutools.info/feature_list.jsp?pj=4&f=823 (accessed on 14/09/2009)
- IDC (2001). The Learning Content Management System, Retrieved from the WWW at <http://www.lcmscouncil.org/idcwhitepaper.pdf> (accessed on 14/09/2009)
- Mallon, D., Bersin, J., Howard, C., & O'Leonard, K. (2009). *Learning Management Systems 2009*, Oakland, CA: Bersin and Associates
- Naidu, S. (2006). *E-Learning: A Guidebook of Principles, Procedures and Practices*, New Delhi: CEMCA.
- Rice, W. (2008). *Moodle 1.9 E-Learning Course Development: A complete guide to successful learning using Moodle*, PACKT Publishing (<https://www.packtpub.com/>)
- Wind, I. (2008). *Moodle Course Conversion: Beginner's Guide*, PACKT Publishing (<https://www.packtpub.com/>)

20.10 FEEDBACK TO CHECK YOUR PROGRESS QUESTIONS

Check Your Progress 20.1

- 1) A learning management system brings in large number of advantages to the online learning. Some of these are:
 - 24X7 available course materials and interactive feature of the website
 - Centralized uniform system both for the teacher and the learner
 - A Learning Object strategy to course deployment, and thus, save time
 - Tracking of student progress and online provision of feedback on assignments and quizzes
 - Collaborative learning opportunity for the students through discussion group
- 2) The most important difference of a LMS and LCMS is the content creation and management ability through the adoption of a learning object strategy that normally is an ability of LCMS and not LMS. However, increasingly more and more LMSs are having the LO authoring/development capabilities.

Check Your Progress 20.2

- 1) Some of these criteria to evaluate learning management system include: Cost of Ownership, Maintainability and Ease of Maintenance, Usability, Ease of Use, and User documentation, User Adoption/ Vendor Profile, Standards Compliancy, Learning Object Metadata Integration, Scalability, Security, Hardware and Software Considerations, Multilingual Support, etc. If you have listed any five of these you are in the right track.
- 2) Any deployment of learning management system would require a number of cost factors to be considered. There is availability of large number of Open Source LMS, and therefore, it is usually argued that they be used in educational institutions. However, other than the annual license fee, there are other costs such as maintenance of the server, hosting charges, administration of the LMS, training of the staff and faculty, etc. So, while considering the total cost of ownership of a LMS, cost related to all the heads of maintaining the LMS be calculated both for proprietary and open source software to take decision.



Indira Gandhi National Open University

STAFF TRAINING AND RESEARCH INSTITUTE OF DISTANCE EDUCATION

Dear Learner,

While studying the units of this block, you may have found certain portions of the text difficult to comprehend. We wish to know your difficulties and suggestions, in order to improve the course. Therefore, we request you to fill out and send us this from as soon as you complete reading this block. Kindly use a separate sheet, if you find the space provided insufficient.

Please mail to:

Course Coordinator (MDE-418)
STRIDE, IGNOU, Maidan Garhi
New Delhi – 110068, India

Questionnaire

Enrolment No.

--	--	--	--	--	--	--	--	--	--

- 1) How many hours did you need for studying the units?

Unit no.	1	2	3	4	5
No. of hours					

- 2) In the following table we have listed 4 kinds of difficulties that we thought you might have come across. Kindly tick (✓) the type of difficulty and give the relevant page number in appropriate columns.

Page Number and Line Number	Type of Difficulties			
	Presentation is not clear	Language is difficult	Diagram is not clear	Words/Terms are not explained

- 3) It is possible that you could not attempt some CYPs. In the following table some possible difficulties are listed. Kindly tick (✓) the type of difficulty and the relevant unit and question numbers in appropriate columns.

Unit No.	CYP No.	Question Not-clearly posed	Type of difficulty		
			Cannot answer on the basis of information	Answer given (at the end of unit) not clear	Answer given is not sufficient

- 4) Any other comment:-