

# COMMUNICATION

## Web-based Distance Education: Considerations for Design and Implmentation

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**Abstract :** *The paper discusses the issues related to deisgn and implementation of web-based Distance Education. Provides simple guidelines to develop useful educational sites, and describes the features of two web-based course development tools (WebCT and Blackboard).*

### Introduction

Cutting edge digital communication and learning technologies have enabled universities to implement distance education to reach a diverse population and provide open learning environments 24 hours a day 7 days a week. In recent years there has been an enthusiastic rush of the faculty to use the World Wide Web to deliver courses not only as a new mode of distance education but also as a supplement to the traditional mode of face-to-face instructions. In this new interface with students, delivery is not restricted to putting up syllabi, assignments, handouts, presentations etc. There is more emphasis on the interactive aspects. Interactivity makes a difference between a programme that present only information from the one that actually trains a learner. Interactivity engages the learner with the material in order to practice skills. The Internet offers tremendous potential for enhancing academic programs beyond the walls of the classroom or campus. Web with its tremendous potentials for interactivity and flexibility offers a greater amount of collaboration in learning. As a global resource it facilitates life-long and just-in-time learning. Another advantage is that the instructions and learning materials do not end with the completion fo lectures. Learners can fall back again and again to develop better understanding of the topics covered.

For effective delivery of the Web based courses, it is important to take into consideration the designing aspcrets and the tools available for course design and management. For designing purpose it is pertinent to consider various aspects like contents, formats and interactivity. Various commercial products are available in the market that has simplified

the process of Web-based delivery of courses. The paper looks into various issues related to designing and implementation of the Web-based instructions.

### **Pedagogic Issues for Web-based Instructions**

In the view of Norman (1995) knowledge resides in the learner's mind in the form of a 'semantic network', an interconnected web of ideas and concepts. Learning takes place in three phases:

- Accretion — when new information is acquired;
- Restructuring — integration of the acquired information to the existing knowledge base; and
- Tuning — for smooth operation of the ever-changing knowledge structure.

Teaching methods should be designed in a manner so that all three stages are covered systematically to make the learner's understanding of the concepts clear. It should also provide activities that challenge and motivate them. It is important to understand the learner's mental models for designing teaching strategies. Effective designing of learning materials can be achieved through proper mapping of structures as the mental model of the learner. Given the fact that learners are at different levels, it may be impossible to exactly match structure of material with the learner's mental models. However, efforts can be made to make it flexible enough to encourage novices while not boring the advanced learners.

The challenge of teaching is to communicate matter in such a way that it is not only easy for learner to understand but also encourages active learning. The success of learning depends to a great extent on the amount of interaction both in the context of learning material as well as the social environment. By liberating the learners from the classroom paradigm, web based courses give them the flexibility and control over time, space and speed of their learning.

In the course designing context, McManus (1996) distinguishes between the Instructional Systems Design (ISD) model with Hypermedia Design Model (HDM). ISD is the traditional model for planning instruction, in which goals of learning are identified, the skills and behaviour required to achieve these goals are analyzed, performance objectives are set, test items are created, instructions are developed and finally learning base is evaluated on the basis of the learner's performance. This is a behavioral approach of instruction delivery. HDM on the other hand focuses on what the learner wants to learn and how the learner chooses to access information. HDM is a cognitive approach, which uses the hypertext systems to produce a learning environment. In HDM the learning domains or matter to be presented to the learner are first identified. The next step is to identify the elements of knowledge to be studied and the text, graphics, sound and video to be used. Two different learning paths are provided, the guided one and the learners controlled one. The guided path provides suggestions to the learners as per the design goals and provides multiple paths to follow. In the learner-controlled path the learners specify their own learning objectives and are able to navigate a path of their own creation. The final stage in HDM is self-reflection, where the learner tries to determine if the learning objectives have been met or not.

The HDM approach is well suited for the present day Web-based instructions. Web elements such as hypertext environments, frames, CGI scripting etc. allows the instructor to go beyond simple representation of information, allowing them to create web based instructions in which the learner can explore as they prefer, develop their own understanding of concepts and skills, and apply learning in realistic settings. It creates a flexible learning environment encouraging active and creative learning.

### Considerations for Designing Web-based Courses

Since web-based learning depends on learner's initiative, providing content in an appropriate form must be the highest priority. Though the multimedia environment of the web may tempt the designer to add as many features as possible, a moderate approach will be most appropriate for making effective web-based courses. For web-based courses following basic design criteria should be taken into consideration:

- *Accessibility* — content must be information-rich without overstressing the bandwidth. Large files pose problem from the access point of view. Since access to web costs money, users would like to use their time effectively rather than waiting for the files to download.
- *Clarity* — educational web site is not meant for gimmicks and decorations. Clarity of language, information structure and visual representation are most important for effective learning environment.
- *Efficiency* — presentation of the content must be precise and to the point. Application of media should be in the nature of value adding at an acceptable loading time.
- *Focus* — the aim should be to achieve depth of information without distracting the learner's focus or attention. The design of web for learning must provide appropriate linkages for deeper understanding of the concepts.
- *Consistency* — consistent interface design creates a sense of familiarity and comfort for the user. Design of the online course must therefore follow a consistent format.
- *Flexibility* — the structure of the presentation must be flexible enough to encourage novices without hindering the proficient learners. Moreover, the layout and structuring needs to be adaptable to changes.

Nielsen (1993) has suggested some usability parameters for designing hypertext and hypermedia. These parameters can be appropriately considered for designing web-based courses. They are;

- *Easy to learn* — the structure and interface must be such that it aids learning.
- *Efficient to use* — structure and interface design must allow learners to focus on the content. From access point of view it must be efficiently structured and requiring less loading time.
- *Easy to remember* — consistency of interface design aids memorization. The content should be clear and to the point to facilitate learning.

- *Error free* — content and structures must be updated at regular intervals and the links checked for providing updated error free information.
- *Pleasant to use* — presentation must be pleasant to attract attention, but unnecessary frills must be avoided.

The various potentials for interactivity provided by the Web can make a real difference to learning. Interactions either Human-human or Human-machine are pertinent for pedagogically effective Web-based courses. Human-human interaction on the web could be either synchronous or asynchronous. Following forms of interactions can be added for Web-based course delivery:

### *Synchronous Interactions*

- *Chat Sessions* — Internet Relay Chat (IRC) is a text-based interaction at real time, which provides the opportunity of multi-directional communication. While IRC can be a place for socializing, it can offer a forum for discussions on specified topics. It can be effectively used for collaborative learning.
- *Real Audio/video conferencing* — streaming audio or videos are now being used for web-based conferencing or live presentations. This technology can effectively be used for Web-based courses to deliver live lectures or for discussion on course specific topics.

### *Asynchronous Interactions*

- *E-mail* — this is the most widely used form of interaction used on the Internet. It is a time independent, fast and cheapest form of one to one communication mode. In a learning environment it can be effectively used for direct interaction with the instructor, submission of assignments/projects etc.
- *Bulletin Board* — this is another form of asynchronous interaction, which can be used for pedagogic purposes. Bulletin boards can be used for the purpose of putting up course syllabus, timetable, course specific announcements as well as a discussion forum.
- *Mailing List* — Mailing lists is a one to many communication mode based on e-mail. It employs listserv for the purpose of delivery. Individual messages are sent to the listserv, which then provides distribution to the subscribers' personal e-mail accounts. Mailing lists are generally text based and typically centered on a certain topic. In Web-based courses, mailing lists can be used for the purpose of course related announcements or for discussion on certain topics.

For Human-Machine interaction, features like HTML based forms, animation, and virtual reality can be added for effective Web-based courses. Forms are basic type of Human-machine interaction used for collecting feedback through surveys and questionnaires. Animation can be used to demonstrate an effect or provide a moving model. Animation can be developed with programming languages like Java, application software such as Macromedia Director or Flash, 3D Studio Max etc. Virtual reality applications can be developed by using application software such as Quick Time VR or by programming

with VRML (Virtual Reality Modeling Language). Animations and Virtual reality applications can help in developing simulated learning environment.

From the content point of view, it is important to consider the elements that are to be added. Four types of elements — text, graphics, sound and video clippings are generally added. Text and graphics are still media, which take less bandwidth as compared to moving media like sound and video clippings. Apart from text all other forms of media undergo some kind of data compression to make it suitable for online delivery through the net. When dynamic media like sound and video files are added, the users must be made aware of file size, file formats, software and hardware requirements. For certain types of file formats special viewers or drivers may be required at the user end. For this appropriate software at the web site itself or links to the appropriate site may be provided for the downloading purposes. For designing the content, factors like accessibility, bandwidth and browser compatibility are crucial.

### **Tools for Implementing Web-based Courses**

There are various options available for implementing web-based courses. Depending on the requirements of the institution, one can either develop tailor made in-house applications with HTML and CGI scripting or go for commercially available Web-based course delivery products. Creating in-house application is a time consuming, expensive option requiring high level of expertise for development. However, the advantage is that it gives flexibility in designing applications as per the requirements.

There are a wide variety of sophisticated e-learning software platforms available in the market, which covers most of the requirements of web-based delivery. Most of them have powerful course management tools that enable the instructors to provide their students with course materials, discussion boards, virtual chat, online assessment and academic resources either as full texts or as links to other sites. Two popular e-learning software platforms are discussed here.

#### ***WebCT***

WebCT (<http://www.about.webct.com>) is an integrated course communication and administration tool. It provides a set of tools to facilitate learning communication and collaboration. It has been developed by educators at the University of British Columbia as a tool to allow other educators to build sophisticated web-based learning environments without a lot of time, resources or technical expertise. It can be used to create entire online course or to publish materials that supplement a classroom based course. With WebCT it is possible to create pedagogically effective web-based educational environment in three ways:

- Fostering communication between the instructor and learner through synchronous and asynchronous modes such as bulletin boards, real chat sessions and e-mail.
- Customizing course elements by using sophisticated tools such as quizzes, searchable indexes, glossaries, reference materials etc.;
- Management of the courses using the administrative tools.

WebCT requires minimal technical expertise on the part of the course designer. It is also simple for the students to use. It is a client/server application which allows the students to use it without installing any additional software.

The latest version WebCT 3.0 has incorporated more consistent user interface, more apparent forms of navigation and tools to help new users get started. The WebCourse Builder helps in putting together the first course within 15 minutes. The Syllabus tool helps new users to easily create their syllabi, using predefined sections or adding custom sections. The Designer Map acts as a control center with links to all of the Course utilities, Course components and tools. Content Assistant takes to the WebCT's e-learning hub where one can search through the communities' libraries to find course content. Types of content include images, videos, CD-ROMs, images, simulation exercises, glossaries and other reference materials.

### ***Black CourseInfo Products***

Blackboard (<http://www.blackboard.com>): CourseInfo and Blackboard CourseInfo Enterprise Edition power the online teaching and learning environments at colleges, universities and schools, associations and other organizations around the world. These products are being used by more than 1600 institutions in about 70 countries worldwide. Blackboard CourseInfo products enable educators to deliver distance learning or enhance in-class instruction by bringing their course materials, class discussions, assignments and quizzes to the Web. These Blackboard products enable institutions to create a campus-wide teaching and learning community that has access to the following core features:

- *Personalised "My Blackboard"* screen for access to course and campus services. It is both a personalized user interface and a centralized login point to the online teaching and learning environment.
- *Content development and management* : Instructors can put up the learning material available on the web easily without the HTML. Existing Microsoft Word, Excel, and PowerPoint files, as well as graphic files, audio and video clips and simulations can be incorporated by point and click process.
- *Communication and collaboration* : Allows enhanced interaction between students and instructors by enabling students to interact and learn from each other on threaded discussion boards. Instructors can also hold virtual office hours or lead online field trips through the built-in virtual classroom environment, featuring real time chat, whiteboard and slide shows.
- *Assessment (quiz) generation and management*: A simple step by step process enables instructors to create quizzes and surveys, including various question types such as: multiple choice, true/false, matching, ordering, fill in the blank, and essay questions. Advanced features include question randomization, and re-use, password-protected tests, timed tests and instant performance feedback for the students. By point and click process instructors can create statistical reports of student answers.

- *System-wide user tracking and statistics:* Administrators can control security permissions and enable/disable features for various user roles and at the same time track and report faculty, student and course statistics.
- *Advanced system management tools:* Instructors and administrators can monitor control and customize the onling teaching and learning environment from any web browser. They can develop and maintain their Course sites through a simple control panel that provides access to all course contents, communication, assessment, user management, site appearance and onling help functions.

Although CourseInfo and CourseInfo Edition share many of the core features and functionality, the difference between these products is based on the sophistication of what the customer can accomplish. The CourseInfo is meant for the entry level or exploratory online learning environments whereas, the Enterprise Edition is to power mission-critical teaching and learning programmes online. The Enterprise Edition is based on more advanced technology with higher scalable architecture. It incorporates a broader range of system management and administrative features.

Both WebCT and CourseInfo products are very popular all over the world. While WebCT gives certain amount of autonomy to the designers, CourseInfo is popular for its simple interface that enables may novice user to put up courses within minutes. Many similar products are now available in the market. However, the decision for going for a particular product will depend on factors like tools provided by the software, the level of delivery i.e., whether it is going to be full fledged distance education programme or a supplement to the class room teaching, the type of interactivity to be provided, number of students to be catered to and finally the financial considerations.

### Conclusion

Web is regarded as potentially transformative or even revolutionary for learning. It is not enough to consider just the technological or more applied aspects of designing such as screen design, application of media etc. for this environment. Designers of web-based courses need to consider some theoretical aspects such as cognitive issues and theories of learning for effective delivery of such courses.

High end products are now available in the market, which has simplified the process of delivering of web-based instruction. Most of these products support content delivery, communication, evaluation and course management aspects. For deciding on a product one must contemplate on the issues like learning goals, interactive aspects and cost-effectiveness. Adopting an appropriate product can go a long way in enhancing Web-based courses.

Web based instruction with added tools for communication and evaluation has the potential to revolutionize the distance education methods. Though there is a tremendous rush towards offering Web-based courses, it is important to consider various issues of designing and implementation for making them pedagogically fruitful.

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