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EVALUATION OF WEB-BASED EDUCATIONAL SYSTEMS

Kyriakos V. Mamoukaris, University of Macedonia
Anastasios A. Economides, University of Macedonia
Nikoleta E. Delchanidou, University of Macedonia

Abstract

Distance Education over the World Wide Web constitutes the spearhead of educational environment. Universities, Institutions and Organizations hence praise the construction of courses over Internet. Consequently, a vital necessity is the identification of the most significant criteria for the development of Web-Based Courses.

I. INTRODUCTION

The last 20 years a unique active area in Computer Science, generally known as Tele-Education, is being emerging. Not only the application of media and technology which nowadays support the educational environment, but also the explosion of Internet provide new methods and techniques to conquer traditional education. Therefore, researchers are pursuing educational challenges and reinforce the fields of learning, training and information systems with the development of several software programs and the production of educational multimedia applications. Tele-Education over the World Wide Web enhances the traditional way of teaching by offering new learning experiences to students. However, a number of questions are yet to be answered. For instance, the most meaningful queries which arose reflect on, the benefits of the web-based education, the effectiveness and efficiency of a formal educational system delivered on the web, the efficacy in the human contact and the consequences over communication. Unfortunately, these tools are not matured enough to perform the personal contact and the feelings experienced when participating in a traditional education environment.

On the contrary, Tele-Education provides a number of tools, which fills in the gaps of traditional education. Considerable benefits thus stem out from the appliance of distance learning. Important advantages are the abolition of geographical constrains (place independence) and the real time communication (time independence). Other reasons for this explosion of education over the web are the competent utilization of users' time, the inexpensive production of the course material, the lower cost of communication through the usage of network connection and the interactivity. Moreover, adequate benefits arise from the disciplinary access control of the users, the students' evaluation, the tracking of students' action, the amount of available knowledge on the Internet and the support of workgroup. Additionally, through the use of World Wide Web equal support of students, personal training and performance of multimedia applications are achieved. Students have the opportunity and the ability to express their experiences and learn through discussions.

Recently, a significant number of web-based educational tools have been developed. Their functionality purpose assists mainly the constructing and authoring of courses. They also contribute to delivering courses over the web and to ensuing secure access of the course material by students and instructors. Automatic grading exams, students' attainment tracking and reporting, statistical analysis of students' performance and course material are additional utilities offered by these tools. Consequently, this kind of software tools facilitates the creation of sophisticated web-based tutorial environments. In this paper a review of five popular Web-Based Educational Tools, WebCT, TopClass, LearningSpace Virtual-U and LearnLinc, is presented.

II. CLASSIFYING SOFTWARE TOOLS FOR NET-BASED EDUCATION DEVELOPMENT

A successful web-based course is created when exploiting the various applications developed for and through Internet. Such are E-mail, E-lists, FTP, Telnet, Usenet, News, as well as a number of other network operations. Supposing that our final goal is the simulation of traditional educational environment and the enhancement with interactive multimedia communication in order to establish Tele-Education over the Web, it is required to take advantage of all the provided tools. For comprehending easily the capabilities of the educational software tools the following classification is vital.

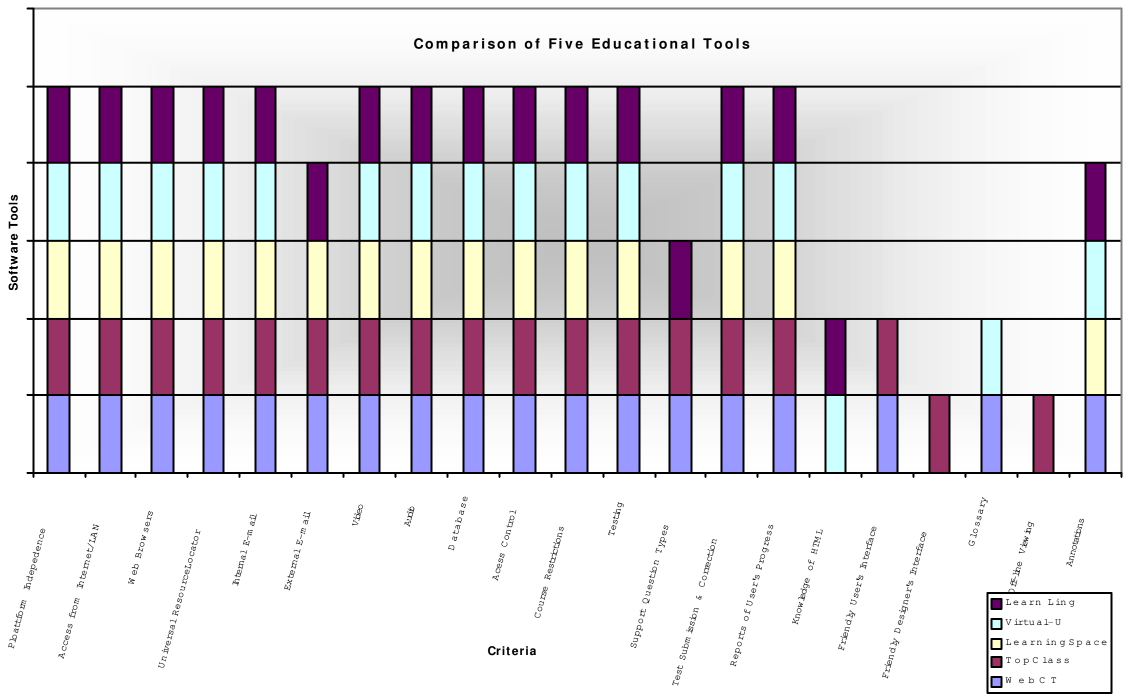
Instructional Design Tools: This type of tools is primarily used for analyzing and scheduling the courses' framework. Through these tools evaluation of the developed course compared to initial expectations is possible, hence a continuous inquiry of the system determines an improved educational environment. ***Media Creation Tools:*** These tools assist to design the course content. Documents, images, graphs, sound, animation and video are easily prepared for building up an integrated environment. Their role is to stretch out the attractiveness of the course material. ***Web Publishing Tools:*** This category of software supports the construction of web pages. Through them management, modification and replacement of pages is encouraged considering the user-friendly environment and expertise programming knowledge is unnecessary. ***Internet Authoring Tools:*** These tools are used for importing integrated web pages and multimedia material upon a determined framework. Therefore they demand intervention with the code of the program in order to produce a satisfactory form of an educational environment. Many lines of script are required and the assistance of an expertise is inevitable. The administrators and the instructors have to be familiar with the code when an error occurs in order to overcome problems. Thus a skilled person with technical knowledge is required to control the authoring tool and the stewardship of the course material. The examination of the educational system's flow also demands the interference of an expert. Under these conditions the program functions properly and is completely controlled. The most well known authoring tools are Asymetrix ToolBook II, Asymetrix Icon Author, Macromedia Authorware, Macromedia Direcor 6, etc. Multimedia Studio, QuestNet+, Oracle Media Objects, Borland Delphi, Visual Basic, Visual C, Visual Prolog. With the help of these tools a powerful educational environment can be developed according to the designers' initial preferences. ***Integrated Tools:*** They contain modules essential for making construction of a course a simple task. Their environment is adaptable according to designer's preferences. Having a predefined form of the course environment, settings can be altered by modifying or adding new functions or by deleting existing ones. Besides, the even-driven buttons empower the training procedure with a friendlier environment. Contrary to authoring tools integrated tools do not need extensive code interference combining a convenient environment for all users (designers, administrators, instructors and students). As a result the support of an expert is trivial whereas in authoring tools is significant. Even the instructor alone can cope with the construction of a course material and the development of an electronic class. The administrator on the other hand coordinates the course and provides access rights to the users. The following integrated tools have been compared; WebCT, TopClass, LearningSpace, Virtual-U, LearnLincTM, Web Course in a Box (WCB), Blackboard CourseInfo, CourseWeb Toolkit, Course Homepage Builder, University of Washington Web Worksheet, Mentorware, Centra Symposium, Data Beam Learning Server, MallardTM, CyberProf, DiscoverWare, Eweb, ClassPoint, POLIS, WILT, FORUM.

Conference Tools: Their functions are used for achieving a synchronous communication (real time communication) through the exploitation of authoring and integrated tools. They are frequently recommended for proving a powerful conference than for simulating a traditional environment because of their limited abilities. In other words conferencing tools provide proper online communication among users, which is not usually recommended for educational environments. Such tools are MS NetMeeting, LearnLinc, CU-SeeMe, Academic CU-SeeMe Commercial, Netscape Collabra, NetProdium, WebNotes, Internet Conference Pro, Real Audio Eventware, PowWow Audio Conferencing, First Class, PlaceWare Conference Center, Embanet, Conferencing On the Web (COW), Lotus Notes/Domino, AltaVista Forum, Intel Proshare, and Cool Talk. All these tools maintain real time communication provided by videoconference, audio conference, whiteboard and chat channels.

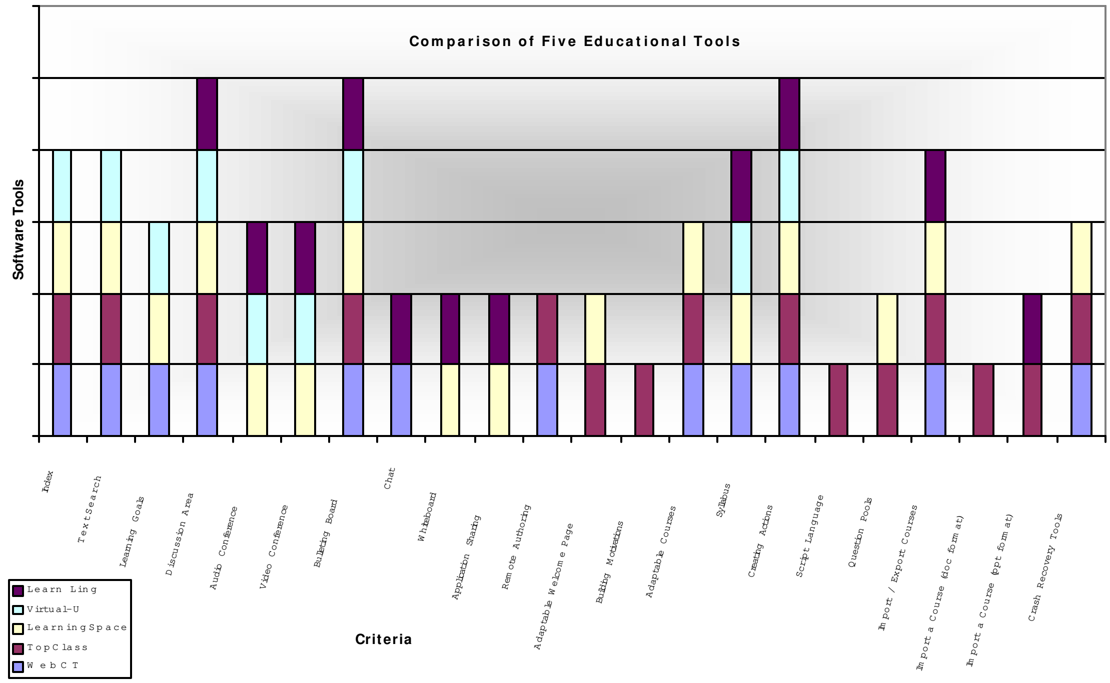
III. COMPARISON CRITERIA EVALUATING EDUCATIONAL TOOLS

Comparing web-based educational environments is a complex assignment. This is justifiable since a huge number of parameters influence performances and functionality of these environments. For a more comprehensive and extensive assessment of software educational tools we categorized them into six groups. Classification of criteria was based on their related features, accordingly to their functionality, interactivity and communication abilities. First group of criteria refers to ***Technology Features*** of the tools. Required RAM, Speed of Connection, Server, Clients, Platform Independence (operating system), Remote Access (Internet or LAN), Web Browsers, ability to refer to a Universal Resource Locator, Internal e-mail to registered user, External e-mail to non registered users, Crash Recovery Tools (which restore the course content and related information without loss of data from communication or server hardware failure), Video, Audio (broadcasting video and audio to users without a video camera and a microphone installed) and Database (internal database or cooperation with external databases) were factors we included in our survey. Additional features, which could be examined carefully, are involved with the installed Firewalls to network and the existing Proxy Server. Second class of criteria is related to ***Access Control***. These are frequently used for preventing access either to courses or to programs, such as Windows NT Control, Basic Authentication and Programs' Authentication. Restrictions could be enabled concerning not only course material but time limitations too, as well as off-line viewing, which is the ability to view a course without being connected to Internet.

Another class of criteria is those relevant to ***Friendliness and Easy of Use*** of the educational environment. In this group all elements associated with designers', administrators' and users' interface are covered. In this research we determined and examined existing different modules in regard to Online Admissions and Registrations, Online Financial Aids Forms and Applications. Significant tutorial objectives are accomplished when Annotations (the capability obtained to students for keeping notes near to course material), Glossary (assistance offered for automatic specification of a list of keywords and their definitions), Automated Index, Text Search and Learning Goals are existing features of the educational tools. ***Collaboration*** criteria contain Discussion Area for supporting threaded communication. Audio conferencing, Video conferencing and Broadcasting to users without a video camera and a microphone installed are included in this group. Other functional characteristics are Bulleting Board enabling downloading and uploading (posting) files over the Web, Chat providing a medium for exchanging conversational data in real time,



Whiteboard supporting shared text window and share drawing, and Application Sharing providing users the ability of running an application on one machine and sharing it over the web. The fifth class involves Professor Assistance criteria. Features for remote authoring and administration of the course as well as for customizing Welcome Page and the Course material are included in this category. Building Motivation (adapting display of the course content regarding users' preferences), Question Polls (repositories for questions), Syllabus (automatic creation of a page with the course's contents) and Language for advanced functions are important factors for constructing a powerful educational environment. Other criteria meaningful for achieving tutorial aims are the tools' ability regarding Importing and Exporting Courses and in particular format, either in a .doc (from word) or a ppt (from power point) file, Number of Question Types, Testing, Submission and Auto-Correction of Tests and Reports of users' progress. Another notable criterion, which is usually disregarded, is the Usability of the chosen tool. The Curve of Learning, Easy of Use, Impact and Expandability measure this. Finally, Price comprises another critical factor taken under consideration in our survey. Unfortunately, companies differentiate the way they cost each product. For instance, WebCT, LearningSpace and Virtual-U prices refer to 100 users per one course. On the other hand, TopClass and LearnLinc calculate the cost for 100 users concurrently participating in the program, regardless the number of the courses, per user. In this case, the number of register users may differ from the one who takes part in the course simultaneously, that cannot exceed the users initially defined. Having tested thoroughly all software tools, we present the five most popular ones. This analysis and comparison was based on practical experimentation with all of them. Naturally, the comparison matrices refer only to those criteria that could be quantified.



Obviously, WebCT gathers many capabilities for accumulating an integrated educational environment. It is also worthy to mention that LearnLinc provides few functions, but it is a new powerful integrated program specialized in synchronous education. Other components of an educational course are: Action pages, Area for Group Works, Calendar, Course and Program Evaluation, Discussion Areas, Glossary, Help Pages, Information Pages, Instructor's Profile, Lectures, List of Information Resources, Map of Site, Online Book Notations, Online Library, Pages of Communication, Pages of Questions, Report Pages, Search Tools, Student's Profile, Syllabus, Time Chart, Workshops. Nevertheless, an ideal Web-Based Educational Environment should support plenty more functions. The table above shows such components that provide supplementary elements to facilitate users' efficacy in their navigation.

IV. CHOOSING THE RIGHT EDUCATIONAL TOOL

Deciding for the proper software tool to build up an educational environment is rather perplexing. Generally, the difficulty of assessing the best product rises from the differentiation of the software tools regarding their special features. Moreover, new products appear every day in tele-education field. Bruce Landon's comparison of WebCT, TopClass, LearningSpace, Virtual-U, Web Course in a Box, Course Info, First Class, PlaceWare distinguishes the first three programs, claiming that TopClass is slightly superior. In the same survey LearningSpace was found to provide excellent synchronous communication features with the support of Databeam Learning Server, a web-based educational product issued from Lotus Company. Herb Bethowey also refers to TopClass as the most capable tool with respect to users' interaction, both between students and among students and instructors. He also points out Learning Space as an excellent collaboration tool, with satisfactory course administration. Sharon Gray's research was focused on the collaboration tools and presumes that LearningSpace is more competent product followed by WebCT and TopClass V2.02. Surveys held by the Universities of Iowa and Manitoba, Daytona Beach Community College and Julie Uiterwijk and San Seoane reach to the same conclusion. They all assume WebCT, TopClass, LearningSpace and Virual-U as the most important educational software tools.

Naturally, it is narrow-minded to pursue a tool just because many others have selected it as the most valuable. However, the unlimited alternatives may cause confusion, unless a logical estimation of the desired goals is produced. The first step for making the most suitable choice is to keep in mind the actual purposes and objective intentions aimed by applying an educational tool for constructing a course. One should identify those important criteria that characterize a web-based class according to the project's conditions and the instructor's preferences. Lastly, considerable though ought to be concentrated on the additional technical adjustments and supplementary accessories one could adopt while using educational tools. In conclusion, a precise and accurate estimation and evaluation of the existing software tools is the only way of acquiring the best solution for creating an ultimate web educational environment meeting our needs.

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