

'Net-Class' and a Comparison of the Web Based Course Management Tools

Bilal Yilmaz, Nese Yalabik, Alpay Karagoz
Middle East Technical University, Turkey

byilmaz@ii.metu.edu.tr, yalabik@ii.metu.edu.tr, alpay@ii.metu.edu.tr

Abstract

A web based course management tool, 'Net-Class', developed in Middle East Technical University is presented. The tool features such as web browsing abilities, instructor and student tools, synchronous and asynchronous sharing is discussed. It is compared to the commercially available tools in terms of these features. The evaluation shows Net-Class is at least as effective as the others in teaching and learning via web.

Keywords: Web based education, course management tools, Net-Class, Net-Class's modules.

Introduction

Education is one of the sectors largely affected by the widespread use of the Internet technologies and the trend shows that the methodologies used in university and continuing education will change considerably in the coming years (Hanna, 1998). This trend presents new opportunities and challenges in learning, especially at a distance. Traditional distance education methods are found to be non-interactive and restrictive in many ways, such as the lack of easy access to the libraries and tutors and time dependency. Use of Internet eases anytime, anywhere learning, with additional benefits such as synchronous and asynchronous ways of communication with tutors and fellow students. These factors increase the quality of education if used properly.

The growing demand for effective web tools in teaching and learning created a new commercial domain. The software developers started to market web based course management packages for educators interested either teaching their course via a web-based environment or using such tools for effective teaching in addition to the

classroom environment.

A good tool should provide effective and fast interaction between the educator and the students, should have student services such as follow up, grades, self tests and should be instructor friendly in exam and homework preparation and evaluation etc (Henderson, 1998).

In this study, 'Net-Class', a software package developed in Middle East Technical University for the same purpose is introduced and a comparison of commercial products with Net-Class is presented. The properties found out to be present in such tools for effective learning are discussed in detail.

Net-Class is already in use for several applications in METU including in-campus teaching, certificate and M.S. programs and it is available for those interested, especially in academic environment.

Net-Class Software

Net-Class is a web based course management system, or learning management system (LMS) that provides an online environment to enable the educators create and manage courses without requiring extensive technical knowledge. According to Advanced Distributed Learning (ADL) initiative, "LMS refers to a suite of functionality designed to deliver, track, report on, and administer learning content, student progress and student interactions" (ADL, 2000). Net-Class, which is an effort to realize this definition, is developed by the Informatics Insti-

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tute of METU in order to provide an effective environment for but not restricted to the distance learning programs offered by the Informatics Institute.

Net-Class has web-based graphical interfaces and uses any web browser as its client side interface. The entire client-side interaction is based on HTML pages and forms. Since the users of the system may be working on various platforms, great care has been taken to include minimum amount of browser specific code because one of the major aims was to provide maximum availability.

Net-Class is developed in **Java** environment, which provides platform independence, ease of maintenance and increased reusability. At the server side, a web server, a servlet engine, and a relational database server is required to setup the Net-Class system. A three-tiered architecture is used in developing the Net-Class. The design characteristics of Net-Class allow platform independence and load balancing by supporting distribution of all servers onto distinct physical machines. However, this is not compulsory, as you may have all servers running on the same machine. The current system architecture is depicted in Figure – 1.

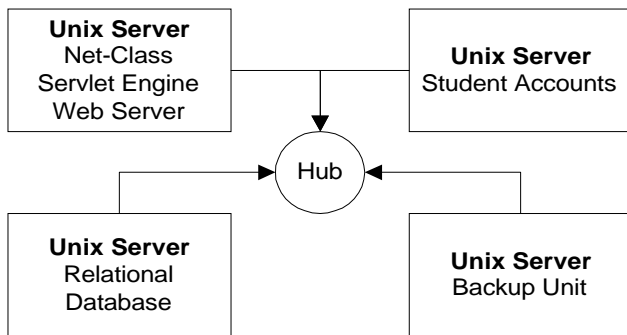


Figure-1 System architecture

Net-Class recognizes three types of statically defined users, instructor, student, and administrator in the system. The other type, assistant, may have changing privileges that are defined by the instructor of the course, to which the teaching assistant is assigned. The system serves the users the relevant functionality by determining the type of the user during the authorization process.

Administrator is the one who manages the processes of Net-Class. He/she has the highest privileges related with the system. By using the admin tools he defines the layouts of courses, arrangement of the instructor and student tools. The modules of administrator are depicted in Figure-2.



Figure-2 Administrator' modules

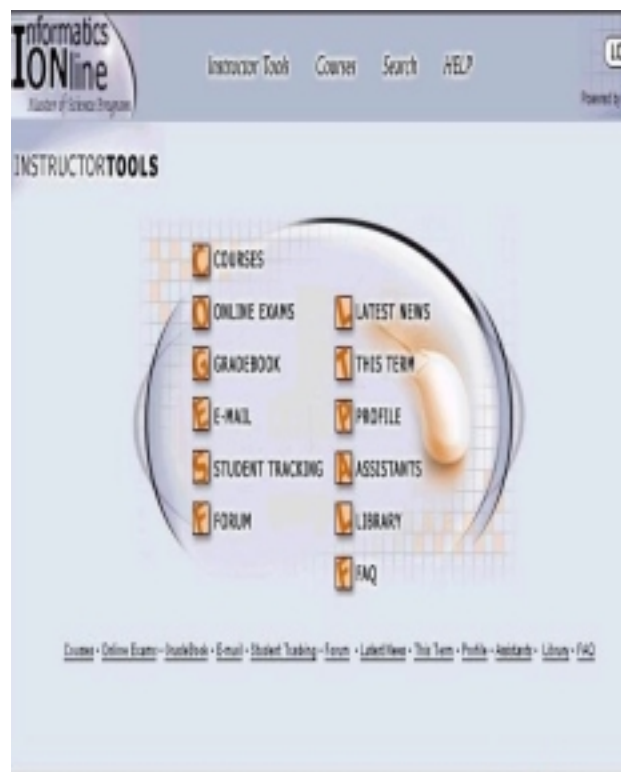


Figure-3 Instructor Tools

Instructors use the available tools to organize course content, apply tests and quizzes, assess students, view their access rates graphically, view and set grades, send e-mail, and organize chat sessions. All of the course data

'Net-Class'

other than lecture notes can be created and edited by the instructor via Web with the use of template pages. Third-party tools may be used for course content creation. Any kind of course data that can be presented within HTML pages can be served via Net-Class tools. Instructor tools are depicted in Figure – 3.

Gradebook module lets the instructor inform the students about the results of the quizzes, homework and other student work that needs to be graded. This feature is important in **motivation building** since students can follow their own progress compared to others in class. It also lets the instructor follow the students' progress and construct final grades quickly since it has features such as sorting. A sample Gradebook web page from Net Class is depicted in Figure-4.

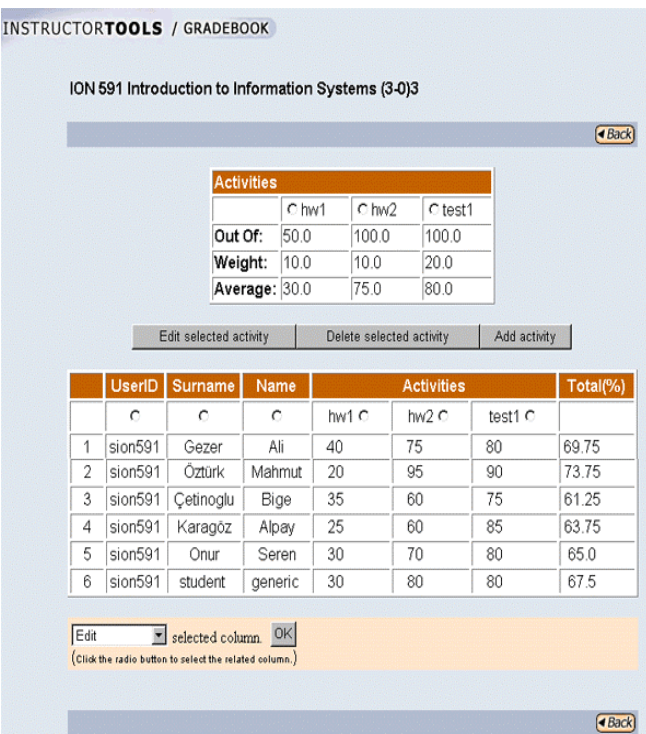


Figure-4 Gradebook module

Student tracking module is an important feature that eases the follow-up of students just as taking attendance in classroom. By entering the student **user id** or **name** the instructor can follow the student's interest in the course materials. The instructor can follow student's accesses to the pages, the time of access and time spent on each of the pages, and contributions to the group projects. This constructs the **skeleton of process tracking**. Histograms showing the statistics of page access per student and as a whole are also available to the instructor,

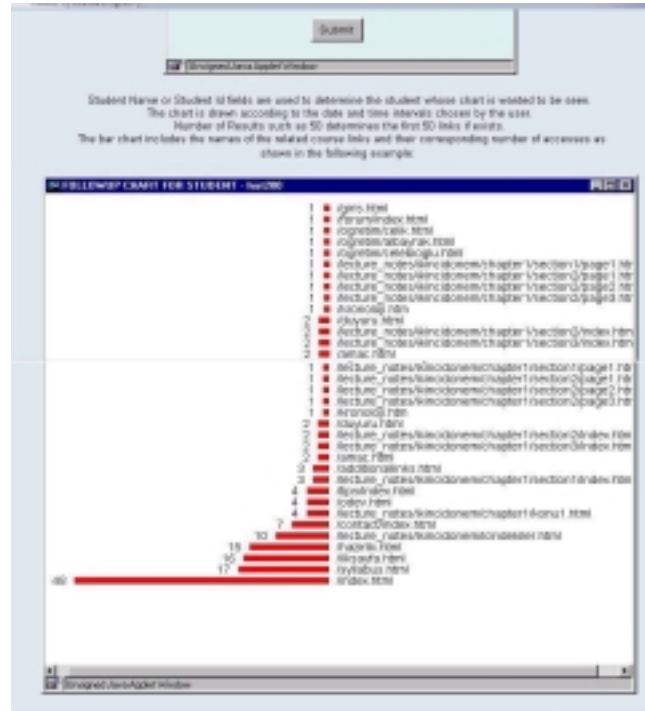


Figure-5 Student tracking module

who can look at most recently visited pages and time spent on each page. Screen shot of this module is depicted in Figure-5.

Forum is another powerful feature of **Net-Class**. Instructor can define **student discussion groups** or **project groups** by using this module. A **new group** is created



Figure-6 Forum module

and only the **instructor constructs the user list**. Students in the same group have the facility of conducting and starting discussions, asking questions and receiving answers in an asynchronous environment. These discussion notes can be **archived**. Instructor can **delete** and **deactivate** each group. To enlarge the discussion environment and increase the sharing of ideas instructor can also **combine** the groups. Archived discussion notes can be searched and **feedback** can be supplied when necessary. Screen shot of this module is shown in Figure-6.

Student side of the system has counterparts of the instructor side. Students can take quizzes, perform exams, view their grades, follow lecture notes, search lecture notes, chat, join the discussions and view course related data. Students may be categorized into groups and have discussions using forum utility. Student tools are depicted in Figure -7.



Figure-7 Student tools

All of the asynchronous communication tools are developed within Net-Class. A third party software is used for synchronous utilities like chat, whiteboard, voice chat, file sharing.

The Net-Class administrator is able to add/modify courses, export course data into html files, add/delete/modify users, announce latest news and publish information about current term using forms. There may be as many administrators as wanted. More details

about the Net-class abilities can be seen in Table 1, whose features are given in the following section.

Net Class is currently in use in METU. Although it is not commercially available yet, collaboration with academic institutions desiring to be a test site is possible.

General Features of Web Based Course Management Tools

While the important properties of Net Class are highlighted in the previous section, a more formal approach for the definition and details of these can be found in Table 1. The categories and subtitles shown in the table can be defined as follows (Landon, 2001):

Web Browsing Abilities

1. **Accessibility:** Presents a text version of the content when the user's browser does not support the frames, tables and images.
2. **Multimedia:** Includes the support for images, audio, and video files.
3. **Bookmarks:** Identifies Internet locations and the creation, display, management and updating of bookmarks.
4. **Security:** Refers to the support for secure transactions on the Web while accessing and making operations on the course site.

Asynchronous Sharing

1. **E-mail:** (Electronic Mail), a communication medium between the tutors and the students.
2. **BBS (Bulletin Board Service) File Exchange:** Supply a mechanism for download/upload course materials via web.
3. **Newsgroups:** Includes forums, conferencing, discussion and other virtual classroom activities.

Synchronous Sharing

1. **Chat:** Includes the facilities like Internet Relay Chat IRC and similar text exchanges.
2. **Voice chat:** Enables a real time conference via microphone and speaker over the Internet connection between at least two people.
3. **Whiteboard:** Includes a shared text window that may also support shared drawings.
4. **Application Sharing:** Includes the running of an application on one machine and sharing the window view of the running application across the Web.

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5. Virtual spaces: Includes Multi-User Domains Object Oriented (MOOs), Multi-User Domains (MUDs), and virtual meeting rooms.
6. Group Browsing: Involves group tour of Web sites with a shared browser window and some interaction capability between the members of the group and at least the tour leader.
7. Teleconferencing: Includes audio conferencing.
8. Videoconferencing: Includes broadcasting video.

Student Tools

1. Self-assessing: Includes self-practice quizzes and other assessment tools that may or may not be scored on-line.
2. Progress Tracking: Includes the facility of checking marks on assignments and tests.
3. Searching: Includes the facility to find out keywords and subjects within the content of the course.
4. Motivation Building: Includes self-help tools and other facilities that provide direct encouragement to student to overcome difficulties.
5. Study Skill Building: Includes simple review tools that help the students how to study.

Instructor Tools

1. Course Planning: Tools enabling at least initial course layout and or structuring.
2. Course Managing: Tools enabling the instructors to collect information from or about students related to their progress in the course structure.
3. Course Customizing: Includes the facility to change the structure of the course.
4. Course Monitoring: Marks the students in order to get information about course resource usage.
5. Instructional Designing: Includes facilities to help instructors to create learning sequences.
6. Presenting Information: Includes facilities for formatting, displaying, or showing course material over the Web.
7. Testing: Includes facilities to assist to the instructors in the making up of practice quizzes, tests, exams, and other assignments.

Data Analysis

1. Marking On-line: Includes the marking of student-generated material while on-line.

2. Managing Records: Including facilities required for organizing and keeping track of course-related information.
3. Analyzing and Tracking: Includes facilities for statistical analysis of student-related data and the facility to measure the individual progress of a student within a course.

Resource

1. Curriculum Management: Includes tools to manage multiple programs, to do skills/competencies management, and to do certification management.
2. Building Knowledge: Includes facilities to gather up the experience of the individual instructor and share the knowledge with other instructors.
3. Team Building: Allows the communication of instructors with common interests.
4. Building Motivation: Includes facilities for self-help and possibly other help (buddy system) to encourage and increase morale.

Administration Tools

1. Installation: Including both software setup tools and installations related services provided by the vendor.
2. Authorization: Tools assigning access and other privileges to specific users or user groups.
3. Registering: Including on-line registration of a student.
4. On-line Fees Handling: Includes tools to accomplish credit card transactions-V-POST.
5. Server Security: Tools used to prevent unauthorized access and/or modification of data.
6. Resource Monitoring: Includes the facility to display the disk space and CPU resources.
7. Remote Access: The ability to perform operations of distributed applications.
8. Crash Recovery: Tools used for recovery from communications or server hardware failure without loss of data.

Help Desk

1. Student Help Desk Support: Tools used to help the student in order to operate on the desired application.
2. Instructor Support: Tools used to help the instructor in order to operate on the desired application.

Server Platform

1. Ram

2. Disk Space: Includes necessary disc space for courses, and students.
3. Platform: Includes the operating system where the applications will work on.

Comparison Table

A comparison of some well-known commercially available tools with Net-Class using the properties discussed previously is made in Table 1.

Results and Conclusions

When above table is examined, the weaknesses and the strengths of Net-Class for each category can easily be seen:

1. Web browsing: as good as others.
2. Asynchronous sharing: No file exchange facility in

Net Class.

3. Synchronous Sharing: Missing in Net Class but also in most others.
4. Student Tools: Same as others, some missing features, such as motivation and skill building.
5. Instructor Tools: Better than others.
6. Data Analysis: Better than others.
7. Resource: Similar to others.
8. Administration Tools: Similar to others.
9. Technical Infrastructure: Satisfactory, Unix and NT based versions available.

In addition, the system has an eye appealing and user-friendly graphical design, which is an important feature missing in the Table.

So we can conclude that the future work will involve

		Learning Space	Virtual -U	Web Course In a Box	Top Class	Do cent	WebCT	Black Board	NET-CLASS
Web Browsing Abilities	Accessibility	-	-	-	-	+	+	+	-
	Bookmark	+	+	-	+	+	+	+	+
	Multimedia	+	+	+	+	+	+	+	+
	Security	+	+	+	+	+	+	+	+
Asynchronous Sharing	E-Mail	+	+	+	+	+	+	+	+
	BBS File Exchange	-	+	+	+	+	+	+	-
	Newsgroups	+	+	+	+	-	+	+	+
SYNCHRONOUS	Chat	+	-	+	-	+	+	+	+
	Voice Chat	-	-	-	-	-	-	+	-
	Whiteboard	+	-	+	-	+	+	+	+
	Application Sharing	+	-	-	-	-	+	+	-
	Virtual Space	-	-	-	-	-	-	+	-
	Group Browsing	+	-	-	-	-	-	+	-
	Tele-conferencing	+	-	-	-	+	-	-	-
	Video Conferencing	+	-	-	-	+	-	-	-
Student Tools	Self Assessing	+	+	+	+	-	+	+	+
	Progress Tracking	+	+	+	+	-	+	+	+
	Searching	+	+	-	-	-	+	+	+
	Motivation Building	+	+	+	+	-	+	+	-
	Study Skill Building	+	+	-	+	-	+	+	-
Instructor Tools	Course Planning	+	+	+	+	-	+	+	+
	Course Managing	+	+	+	+	-	+	+	+
	Course Customising	-	+	+	+	-	+	+	+
	Course Monitoring	-	+	+	+	-	+	+	+
	Instructional Designing		+	+	+	+	+	+	+
	Presenting Information		+	+	+	-	+	+	+
	Testing		-	+	+	+	+	+	+

Table 1. Comparison of features

'Net-Class'

		Learning Space	Virtual -U	Web Course In a Box	Top Class	Do cent	Web CT	Black Board	NET-CLASS
Data Analysis	Marking Online		-	+	+	+	+	+	+
	Managing Records		+	+	+	-	+	+	+
	Analyzing & Tracking		+	+	+	-	+	+	+
Resource	Course Curriculum		-	+	-	-	-	+	+
	Building Knowledge		+	+	+	-	+	+	-
	Team Building		+	+	+	-	+	+	+
	Building Motivation		+	+	+	-	-	+	+
ADMINISTRATION	Installation		+	+	+	+	+	+	+
	Authorization		+	+	+	-	+	+	+
	Registering		-	+	-	+	-	+	+
	Online Fee Handling		-	-	-	+	-	+	-
	Server Security		+	+	+	-	+	+	+
	Resource Monitoring		+	-	+	-	+	+	-
	Remote Access		+	+	+	-	+	+	+
Crash Recovery		-	+	-	-	+	+	+	
Help Desk	Student Support		+	+	+	-	+	+	+
	Instructor Support		+	+	+	-	+	+	+
Technical Info	RAM		24MB	64MEGS	16MB	256MB	128MB	+	64MB
	Disk Space		500MB	10MEGS + 50K (per course)		1GB	10MB+2MB per course + 50-70K per student	+	10MB+2MB per course +20-50K per student
	Windows NT Server		+	+	+	+	+	+	+
	Apple Server				+				-
	Unix Server		+	+	+	+	+	+	+

Table 1. Comparison of features (Continued)

completing the missing features and especially student skill and motivation building using AI tools, in addition to preparing a Turkish version.

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Biographies

Bilal Yilmaz is a M.S. student at Middle East Technical University. He goes on studies on distance learning as master thesis.

Nese Yalabik is a professor at Middle East Technical University, Computer Engineering Department. She is also Director of Informatics Institute at the same university.

Alpay Karagoz is a M.S. student at Informatics Institute of Middle East Technical University. He has been studying on distance education for 2 years, and developing a learning management system.