
Web-Enhanced Chemistry Laboratory Courses in the University of Santo Tomas Faculty of Engineering

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ABSTRACT

The e-Learning Access Program of the University of Santo Tomas Faculty of Engineering employs the Blackboard Learning Management System in the General Inorganic Chemistry Laboratory Courses (Chem111L and Chem112L). The system demonstrates the advantages of web-enhanced courses and why e-learning should be incorporated with conventional learning in the chemistry laboratory. The development and deployment of online course sites for Chem111L and Chem112L are discussed with some recommendations to further improve this learning system and help students appreciate the principles behind the activities in the chemistry laboratory.

1. INTRODUCTION

Computers and the internet are technological advances which are very familiar to most students today. People use computers and the internet not just for word processing or data collection, but also for entertainment, recreation, research, and education [1]. For this reason, it is an educational strategy [6] to take advantage of the evolution of the computer and the development of the internet into a synchronous and/or asynchronous mode of communication and a very powerful tool for learning [7]. Web-enhanced

courses, courses with additional instructional materials accessed through the internet, have been available in the University of Santo Tomas through the e-Learning Access Program (e-LeAP) of the Educational Technology (EdTech) Center of the university. The EdTech Center adopted the use of the Blackboard Learning Management System for the development of online courses.

2. E-LEARNING ACCESS PROGRAM (E-LEAP) OF THE UNIVERSITY OF SANTO TOMAS

The e-Learning Access Program of the University of Santo Tomas was launched in August of 2002 through the pioneering efforts of the EdTech Center of the University. The program's objectives include:

- (a) standardizing of general courses: mathematics, chemistry, languages, social sciences, etc., throughout the different faculties and colleges of the university
- (b) enhancing the general courses by creating an online course cartridge wherein additional learning materials are available to students anytime and practically anywhere
- (c) capitalizing on the wide acceptance of online materials by the students
- (d) adopting innovative teaching strategies which promote collaboration and interaction among the members of today's generation – the Homo Zappiens [5].

To create these online courses, the e-LeAP Management Team adopted the use of the Blackboard Learning Management System (LMS). They conducted a series of trainings for administrators and

faculty members, tasked with the development of such online courses. The first wave of the series of Blackboard trainings involved faculty members who teach general courses like mathematics and chemistry.

credited with 3 laboratory units for one semester for the creation and development of the online course.

The developed online course site contains class notes, web links, online activities, online assignments, online examinations, and other features



Figure 1. *The UST e-LeAP welcome page*

3. CREATION OF GENERAL INORGANIC CHEMISTRY LABORATORY COURSE SITES

General Inorganic Chemistry (Chem111 and Chem112) and General Inorganic Chemistry Laboratory (Chem111L and Chem112L) Courses are considered as general courses in the University of Santo Tomas. In order to standardize these two general courses, trainings on the use of the Blackboard Learning Management System were conducted, specifically for Chem111L and Chem112L instructors. The instructors' individual performances related to the use of the Blackboard LMS were evaluated to select qualified course developers. The selected developers were then assigned to create the master site for online chemistry laboratory courses. The time spent in the creation and development of such online courses was considered as an equivalent teaching load for the selected faculty developers. Faculty developers were

such as announcements, discussion board, and an online grade book. These features are used to communicate to any or all members of the course site. The course site may contain text-based instructional materials, still and animated pictures, and/or even videos.

4. DEPLOYMENT OF THE LABORATORY COURSE CARTRIDGES

One semester of an academic year was allotted for the creation and development of online course sites, such as those for the Chem111L and Chem112L courses. After the development period had elapsed, the online course was set for deployment. During deployment, the designated course site developer was expected to continue developing the course site by adding, subtracting, or managing the content of the course site which would be available to the students.

The deployment of an online course cartridge means that the online course is ready for the use of

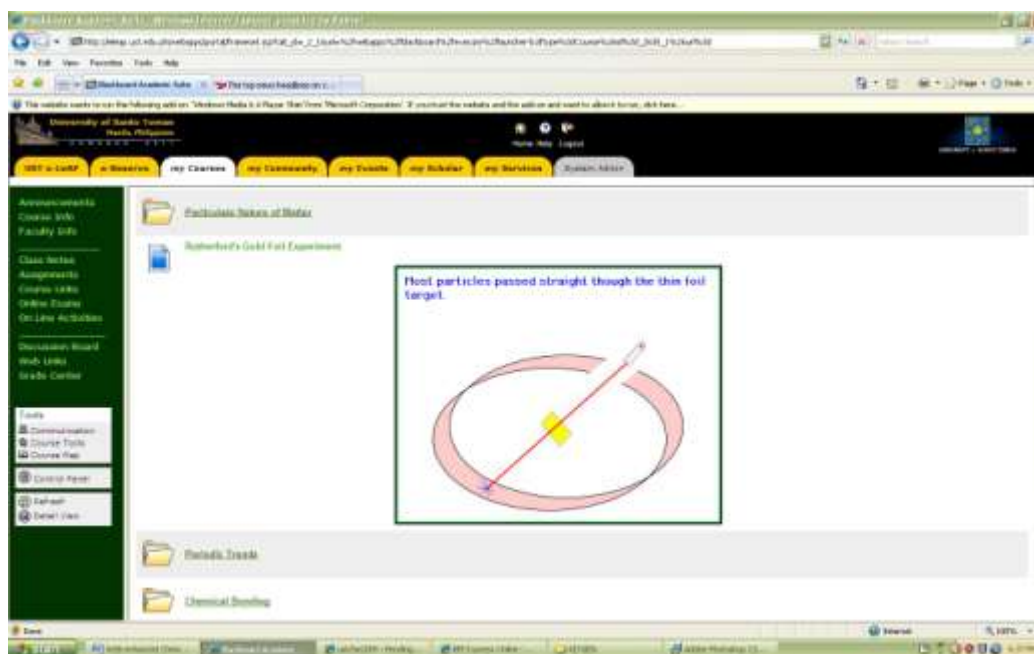


Figure 2. Chem111L announcements page



Figure 3. Eleap content area

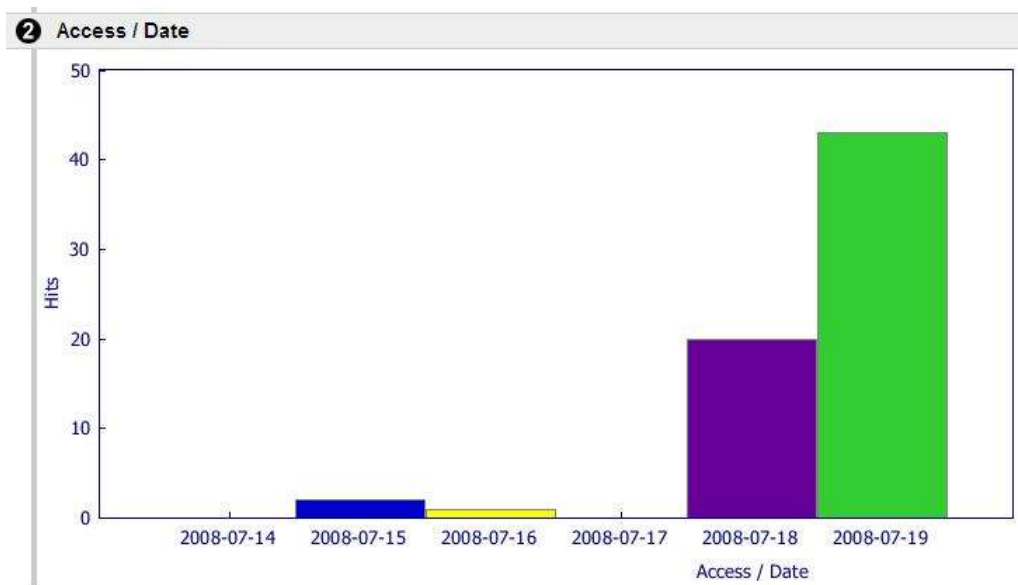


Figure 4. *Date of access versus number of hits*

the students who are enrolled in that particular course. Students are given their usernames and passwords to be able to access the online course sites using any computer terminal within or outside the university. The usage of the online course is monitored by the assigned course instructors, and additional credits are awarded to students who optimize the use of the available features in the course site.

The usage of the online course is measured using the course statistics tool which reports the number of hits per day or the number of hits per student per content area (see figures 3, 4, and 5). The course statistics tool may also present the number of hits according to how the hits are distributed during the time of the day or the day of the week.

5. CONCLUSIONS AND RECOMMENDATIONS

The use of the Blackboard Learning Management System is an innovative approach to learning laboratory principles and activities, but the use of this learning system requires investments in computer technology and infrastructure. Instructors should undergo continuous and extensive training to acquire the skills of a good course site developer and live through the principles of continuous learning.

Although students, in general, show positive response to the use of online course sites, creative strategies should be enhanced to improve the acceptance of this relatively new learning tool by the general users, such as the general student population and other instructors and professors. In addition an evaluation tool should be properly created with the course site.

Course site developers should also learn to optimize the design of the use of the different content areas and tools available in the Blackboard Learning Management System. Whereas some instructors may find the discussion board (figure 7) useful for post-laboratory discussions and asynchronous exchange of information; other instructors may prefer to use synchronous (real-time) online forums by using the chat room.

The online grade book (or grade center) is another major feature of the course site which should be maximized by the instructor. This tool can be used to record, store, and compute the grades of the students (see figure 8). Each student will be able to view his/her grade for each of his/her graded requirements. With all these content areas, communication tools, and grade book functions, the Blackboard LMS can be integrated into the Chemistry Laboratory courses as a learning and educational management tool to further advance the chemistry laboratory experience of students as well as their instructor.

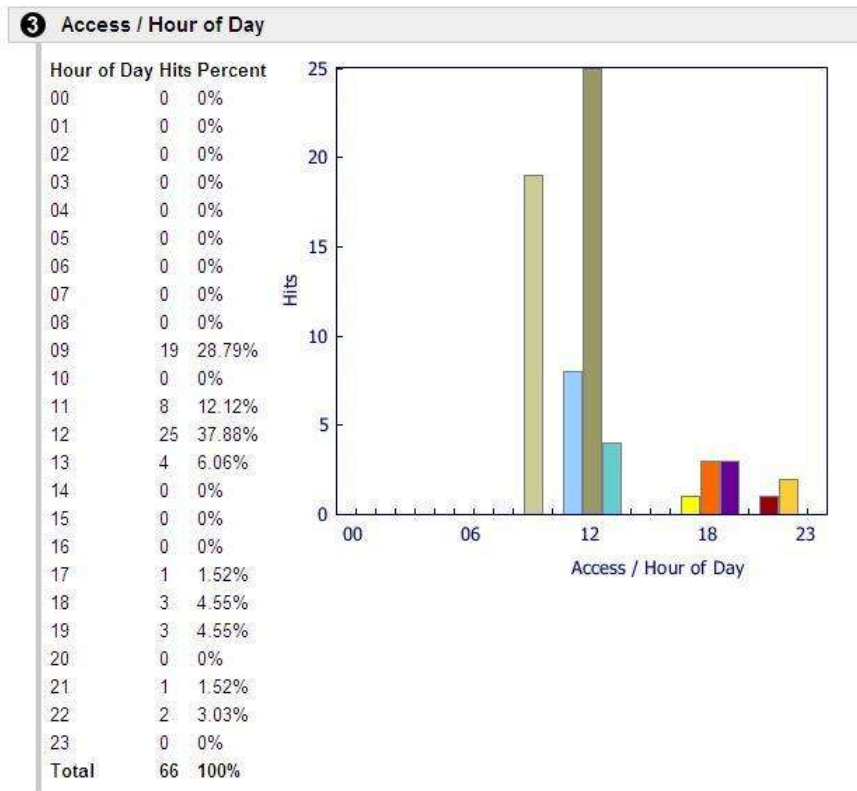


Figure 5. Day of the week versus number of hits

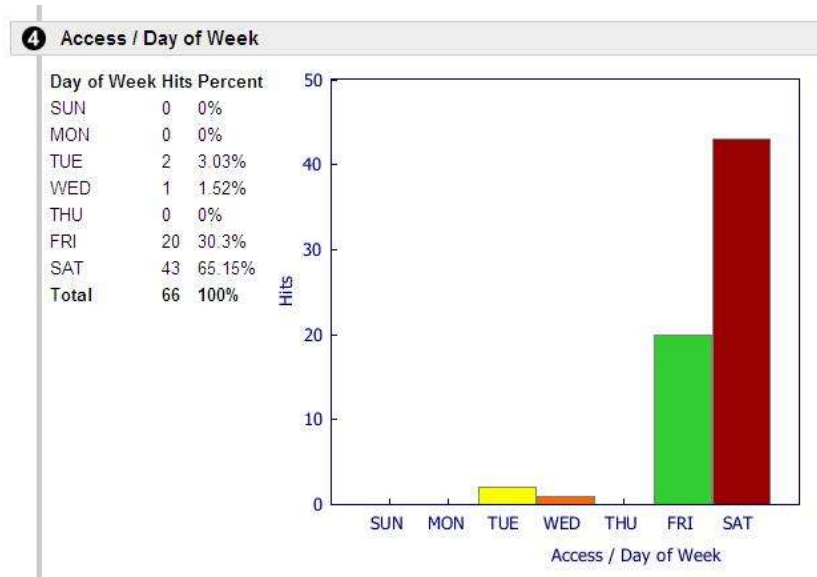


Figure 6. Hour of the day versus number of hits

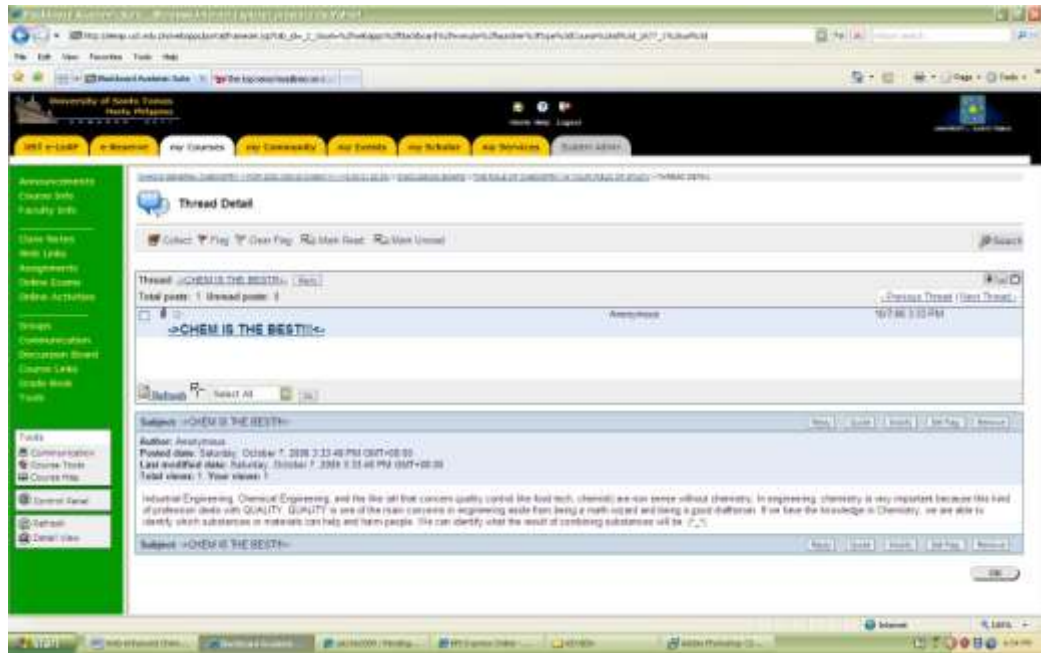


Figure 7. *ElEap discussion board*

The screenshot shows a "Gradebook View Spreadsheet" with columns for Student Name, Section, and various assessment scores. The data is as follows:

Name (Last, First)	Section	Mid-1	Mid-2	Problem Set	Mid-3	Quizzes	Final Exam	Total Grade	Final Grade	Final Percentage	Final Grade	Final Percentage
Asuncion, Angelica	12	85	85	85	75	85	85	2.00	1	100	100%	100%
Avardana, Rose Lily	11	88	88	88	88	88	88	2.00	1	100	100%	100%
Balboa, Jay Anthony	10	90	90	90	90	90	90	2.00	1	100	100%	100%
Balboa, Rose Louise	10	90	90	90	90	90	90	2.00	1	100	100%	100%
Ma, Chae	11	88	88	88	88	88	88	2.00	1	100	100%	100%
Basco, Vincent Zach	11	88	88	88	88	88	88	2.00	1	100	100%	100%
Arceche, Maria Angelica	11	88	88	88	88	88	88	2.00	1	100	100%	100%
Arceche, Maria Anne	10	88	88	88	88	88	88	2.00	1	100	100%	100%
Barajas, Arnel Nathaniel	10	88	88	88	88	88	88	2.00	1	100	100%	100%
Bernal, Marissa	10	78	78	78	78	78	78	2.00	1	100	100%	100%
Bernardino, Egan Bruce	10	88	88	88	88	88	88	2.00	1	100	100%	100%
Calaga, Miguel Carlo	10	88	88	88	88	88	88	2.00	1	100	100%	100%
Calayan, Christopher Sir	10	88	88	88	88	88	88	2.00	1	100	100%	100%
Carmona, Jason	10	88	88	88	88	88	88	2.00	1	100	100%	100%
Carmona, John Emmanuel	11	88	88	88	88	88	88	2.00	1	100	100%	100%

Figure 8. *ElEap grade book*

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