

STATE-OF-THE-ART DELIVERY OF CIS CURRICULUM WITH A SPECIAL COMPUTER LAB

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ABSTRACT

The opportunity to deliver Information Systems curriculum in an innovative teaching/learning computer lab funded, built, and operated by a school of business allows teaching in an interactive hands-on environment where students can “learn by doing.” The lab can be isolated from the campus network, allowing students full administrative privileges over network, server, and client settings. This account follows the configuration of the lab, the courses taught in the lab, the advantages of students experimenting with network administration, server installations, hosting Web servers and services, configuring software, and other perceived benefits. The lab’s application to three upper-division CIS courses is addressed.

INTRODUCTION AND BACKGROUND OF A CIS CURRICULUM FOR MAJORS

The Computer Information Systems (CIS) Department of Metropolitan State College of Denver (MSCD) has an experiential approach for teaching both lower- and upper-level courses. Where appropriate, labs are used to supplement the delivery of the concepts. The regular student labs work well for desktop programs such as Access and Word. However, what about the needs of CIS students, especially upper-level students that need to learn about operating systems, web servers, and advanced concepts in programming languages?

The Metro special lab, designed and implemented in 2001 through the work of the CIS faculty and the IT department, resolves these problems as it is a lab devoted to courses with special requirements. The special lab has been designed to accommodate the needs of upper-level classes whose needs cannot be met in the regular student labs. Since the inception of networked campus labs, due to IT management issues and security of the campus network, Information Systems majors were severely restricted from practicing much of the theory presented in their course of study. There were many, many areas where Information Systems majors still had to concentrate on textbook and instructor presentations and demonstrations without the benefit of actually practicing the theory presented. In an effort to provide true hands-on experience for IS majors, the School of Business of Metropolitan State College of Denver built a dual-purpose two-room lab where students could attend classroom sessions and also work independently to complete course assignments on their own time.

CLASSES SUPPORTED

Overview

Currently 90% of the courses using the lab are upper-division CIS courses. An econometrics course, a finance course, and a marketing course are examples of other business courses held in the lab. The lab is also an excellent location to host presentations from special speakers. Following is a description of the

application and benefits of the lab to three classes.

CIS 3260 Information Systems Development with GUI Tools

The *Information Systems Development with GUI Tools* course (CIS 3260) emphasizes developing within an IDE (Integrated Development Environment) and incorporating the .NET Framework classes and CLR (Common Language Runtime) using C#. This class required an additional smart device investment. Dell PocketPCs with WI-FI capability were selected, so they can serve as a client and wirelessly access the student desktop computer station acting as its server. Development for all applications, whether Web applications or not, is on the student station using the *Visual Studio .NET 2005 Professional* software. The installation of *ActiveSync* software allows students to move their applications to the PocketPCs from their server computers using a USB connection—a simple drag and drop operation. The students can program their Web applications using the IP address of their own server for the Web reference, thus allowing them to wirelessly consume a Web service. The opportunity for better understanding of Web services and smart mobile devices is present.

Combining Web services with mobile applications allows the class to experiment with wireless technology— WI-FI, infrared beaming, and Bluetooth short distance FTP, all of which are included on the Dell PocketPCs. Mastering the process of consuming student-constructed Web services requires the use of the campus wireless Web connection. The existence of the campus WI-FI BlueSocket Web site simplified the process of using the PocketPCs to connect to the student lab servers. The campus installed Wireless Access Points (WAP) throughout the West Classroom Building in 2004. The School of Business special lab is housed in this campus building. Therefore, students in the C# class can simply login to the BlueSocket Metro site with their PocketPCs, and then connect to their individual lab servers via the IP address. Aside from the security of their assigned lab servers and their vulnerability to outside modifications or removal of their programs (backups are constantly stressed), student implementation is optimal. Students are responsible for programming their own applications and maintaining their assigned PocketPCs. The use of WI-FI and PocketPCs for the *Information Systems Development with GUI Tools* course allows students not only to learn the C# programming language; it exposes them to current technology.

CIS 4030 Web Site Administration

The *Web Site Administration* course exposes students to many areas that are related to this highly complex field. The prerequisite is a web page development or a web-related programming course (e.g. Java).

The class is using a *Windows XP* personal server to work with *IIS*. The students have administrative rights to make any configuration changes. By default it is running on port 80. With *IIS*, students review the basic setup and configuration topics (user, directory, port, security settings, privileges). They customize the server by creating a custom 404 error page and an alias with their own name. In a following assignment they work with SSI (Server Side Includes) configurations and options to learn how some content can be regenerated and dynamically inserted into web pages. Students create a small guestbook application with ASP (Active Server Pages) to learn about one of the server-side solutions (for the *IIS* environment). They install their own *Apache* server and compare its text-based configuration settings (`httpd.conf` file) with the GUI-based controls of the *IIS* server. The *Apache* server runs on port 8080 so it does not interfere with the *IIS* operations. They repeat the SSI assignment also in this environment and contrast the different configuration options.

For a different server-side programming experience students use Perl on the college's UNIX server. They customize a Perl guestbook solution which has similar functions to the ASP solution. For the use of an application server, a *Coldfusion MX* server is available for the students to create dynamic web pages utilizing another server technology. The application server has connections to *Access* databases, and students write CFML (ColdFusion Markup Language) code with embedded SQL query statements. XML (Extensible Markup Language) is an emerging technology for generic data format. Students review the different XML related topics, and create and compare solutions applying CSS (Cascading Style Sheets) and XSLT (Extensible Stylesheet Language Translation) for XML data delivery. They configure both their *IIS* and *Apache* servers to host the XML solutions.

CIS 4280 Network Installation and Administration

Network administration is a classic example of material that is impossible to support in a regular student lab. The special lab supports teaching this material in a lab environment by allowing each student to act as an administrator. One of the built-in hard drives contains *Windows Server 2003*. Each computer in the lab is configured as a domain controller with a total of 11 domains in the lab and two additional domains in the adjacent open lab. In the *Windows Server 2003* setup, the lab is isolated from the rest of the world using router technology. Students can perform all administration tasks, as misconfiguration of one's Special setup is not going to affect students coming in afterwards for another class. Also imaging technology allows for easy recreation of a drive when something goes wrong.

Students get full exposure to managing Active Directory using this setup. The logical structure of Active Directory consists of one forest, one tree, and 13 domains. A domain controller in the root domain acts as a Global Catalog server and as the DNS (Domain Name System) Server for the environment. Other setups in the lab are not disconnected from the lab and therefore use the college's DHCP (Dynamic Host Configuration Protocol) and DNS servers. Students can perform any administration task. They can change the domain functional level, create organizational units, and delegate administrative control. This multi-domain structure is ideal for giving students hands-on experience with a complex Active Directory environment. Students can see which groups exist in a parent domain versus a child domain in the logical structure, for example Enterprise Admins. This experience reinforces learning the network administration concepts. The physical structure of Active Directory consists of only one site. To get exposure to administering this part of Active Directory students simulate the creation of subnets, Active Directory Sites, and then create site links between these simulated sites. They also get to work with the concepts of a Global Catalog Server and flexible single master operations (FSMO). As the Special setup is isolated using router technology from the rest of the world, students can get exposure to basic TCP/IP administration by configuring IP addresses and subnet masks. Initially students use static addresses and later they configure DHCP servers to lease IP addresses and subnet masks without affecting the campus network. Lastly, students create and configure their own DNS servers.

CONCLUSIONS

The authors believe that Information Systems majors who completed their major study since the opening of this lab are better prepared, and generally better educated than our majors of the past decades. Our conclusions are in unison with the advisory board for the CIS Department. The level of skills expected of new graduates today, and the breadth of knowledge expected is increasing with each year. The experiences of Metropolitan State College Information Systems majors who used a special computer lab may help other programs with their Information Systems curriculum delivery.