Hacking Blackboard: Customizing Access to Library Resources Through the Blackboard Course Management System

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Abstract:

Academic libraries have long been trying to gain access to users through their favorite online spaces, such as social networking sites. In this article a project of the University of North Carolina at Greensboro's University Libraries, which integrated library resources with the campus course management system, Blackboard, is detailed. The main objective was to push the best resources to students based on their actual needs. For years, static HTML Web pages were created, but the proliferation of these pages required tremendous maintenance. In addition it is not certain that students are able to access the most relevant resources buried deep in the Web site. Because of these challenges, the Course Resources Tool and the Library Resources Portal were created to provide high levels of customization based on information that was gathered from users as they log into Blackboard. The tools have been customized so that subject specialist liaisons can integrate library resources at the major, department, course, and course section levels. Despite some difficulties in launching and promoting these projects, there has been positive feedback. There was also an increase in usage statistics that rivals the use of the library's main Web site. This article describes the tools, documents the difficulties with each phase of the project, and discusses the lessons learned. Also, a brief overview of possible expansions of the Blackboard Course Resources Tool and the Library Resources Portal is provided.

Keywords: Blackboard | course resources | academic libraries | course management systems | Web application | integration | customization | subject specialist | Google | Library 2.0 | ASP.NET | Web services | research guides | subject guides

Article:

INTRODUCTION

Ever since the arrival of Web 2.0 tools, academic librarians have attempted to harness the power of these emerging technologies. They have debated the merits and challenges of entering the social spaces of students through Facebook and MySpace. They have expanded into the blogosphere with a myriad of library blogs. All of these efforts have had the primary goal of pushing the library and its resources into the spaces that patrons are fond of frequenting. Similarly, on the university campus, resources are being pushed into the course management system (CMS)—the space that students are required to frequent.

The University Libraries at the University of North Carolina at Greensboro (UNCG) have developed a unique approach to integrating library resources with Blackboard 8, the University's CMS (http://www.blackboard.com/). Using information about students, such as their majors and their current classes, allows a high level of customization and integration of they library's resources at several levels: major, department, course, and course section. The goal of this article is to illustrate an approach to integrating library resources with a CMS. The justifications for such an approach is explained, along with a description of methods for implementation.

OTHER INTEGRATION EFFORTS

In the early 2000s, CMSs became widely used in academia, and since then, librarians have sought ways to push library databases and other electronic resources into the CMS. Unfortunately, CMSs did not provide avenues for automatic integration (Cohen 2002, "Course management software" 2001); therefore, librarians have needed to examine the possibilities for ad-hoc integration at various levels. John Shank and Nancy Dewald delineated these efforts as "macro-level library courseware involvement" and "micro-level library courseware involvement" (2003, 38). The macro-level involves pushing content across all classes with low levels of customization, while the micro-level focuses on individual librarians working within specific courses. Other authors have borrowed from Shank and Dewald's framework for understanding approaches to integration (Lawrence 2006; Collard and Tempelman-Kluit 2006;Ashmore and McNeal 2008; Washburn 2008).

Many librarians would agree that integration with the campus CMS is a worthwhile effort. It allows the creation of a presence for the library in the virtual spaces most often used by students for academic purposes. As Beth Ashmore and Lisa McNeal noted in 2008, "The library's resources are placed more conveniently at the point of need in the online classroom environment" (206). Moreover, Rob Lenholt, Barbara Costello, and Judson Stryker maintained that integrating library resources with the CMS shifted focus away from students "struggling to locate Web sites and databases" to spending "more time doing actual research, utilizing critical thinking skills, and assessing the information and data they discover" (2003). Integration with the CMS gives us the ability to highlight our best resources rather than having them hidden within our library Web sites.

The authors became interested in this project because of the evolving environment at UNCG. With an enrollment of 17,500, UNCG is steadily gaining students and programs, and with that growth, there has been a proliferation of library Web pages and resources. It has become difficult to maintain thousands of static HTML Web pages. The main concern for most librarians working within their university's CMS has been deciding on the degree of integration. At UNCG, the wish was to customize efforts as much as possible.

Creating highly customizable tools was possible because the UNCG library has an in-house Electronic Resources and Information Technology team with sixteen staff members. The team (ERIT) is responsible for the library's catalog, electronic resources, digital projects, hardware and software support, distance education, and Web maintenance. Heading the Web group is a full-time applications programmer. In addition, the Blackboard administrator on campus has given his full cooperation; without his assistance and openness to our ideas, the project would not have been started.

The first step was to give subject specialist librarians the ability to push specific resources to the department, course, and course section levels. The next step was to use information about individual students in order to push databases and other tools appropriate to their majors.

FIRST STAGE: THE COURSE RESOURCES TOOL

Initially, the focus was on the creation of a library tool within the Blackboard CMS that would deliver customized resources to the department, course, and even section level. A tool was desired that displayed links to the library's databases and specific journal listings using the OpenURL resolver and provided contact information for the librarian subject specialist. With the Course Resources Tool, subject specialist librarians can associate resources with all the courses within a department (e.g., English), with specific courses (e.g., English 101), or with a specific section of a course (e.g., English 101–01). [1] The ability to bypass re-authentication is an essential feature of the Course Resources Tool; once off-campus students have logged into their Blackboard account, they do not need to re-authenticate to use a specific database (see Figure 1). The bypass of re-authentication was successful because an exception in the EzProxy user file was created, allowing any traffic originating from Blackboard to bypass the EzProxy authentication screen and directly access vendor database content.
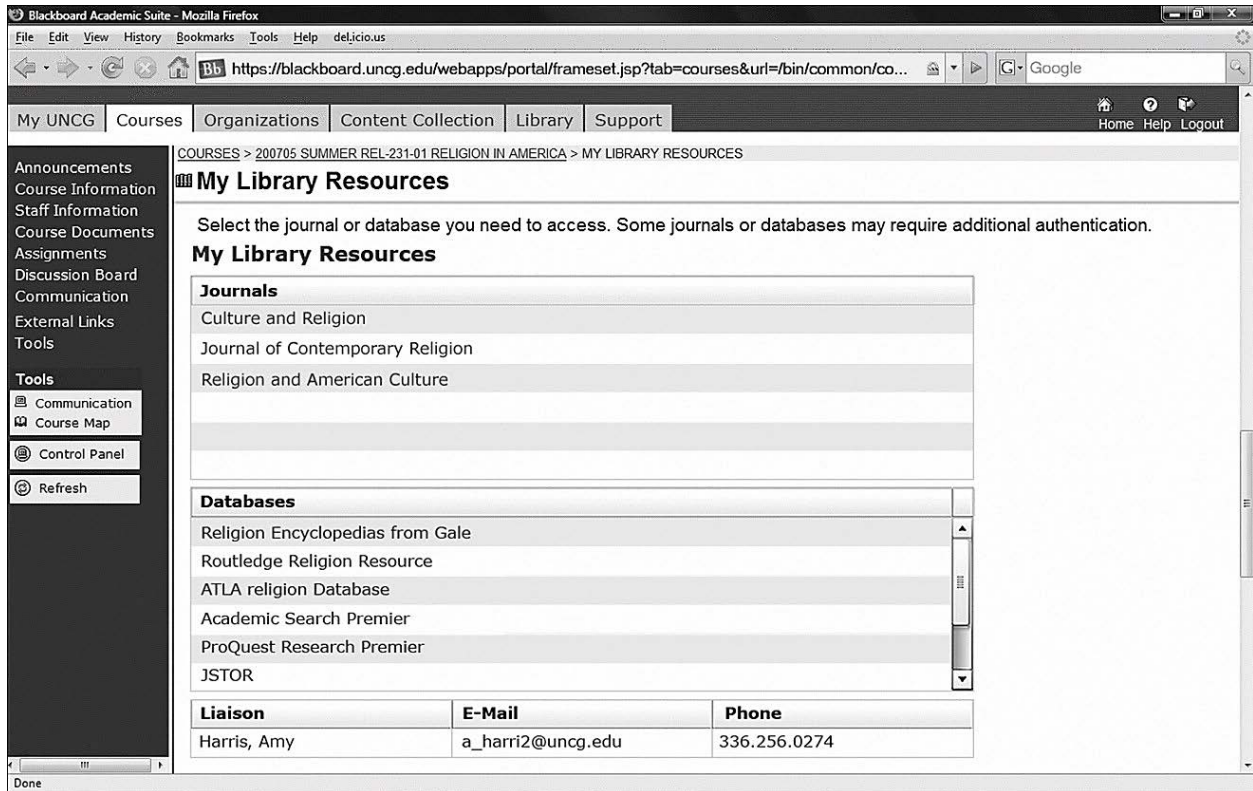
FIGURE 1 UNCG's Course Resources Tool.

The ERIT team used a number of different data sources in developing the Course Resources Tool. Information related to courses themselves (course, number, section, and abbreviation) is downloaded from Banner 8, the University's student information system created by SungardHE (http://www.sungardhe.com/). VDBS, UNCG's in-house SQL Server 2000 database tool, which includes the Libraries' vendor databases, Web sites, and information about subject areas, is used for accumulating and sorting all the database- and subject-oriented resources for each class. Microsoft's Active Directory provides contact information for the subject specialist librarian.

Next, ERIT created a custom administrative interface in ASP.NET, which allowed the appropriate subject specialist librarian to aggregate these various bits of data. The data set is delivered into Blackboard dynamically, based upon student login, using ASP.NET Web services. The task of associating resources with particular university departments was assigned to twelve subject specialist librarians, because they have close working relationships with their teaching faculty and are knowledgeable about appropriate databases and Web sites for course assignments.

Instructors have become accustomed to using Blackboard with their courses, especially the grading components. All courses at UNCG have a Blackboard course space; however, instructors must activate access each semester. The Course Resources Tool beta was launched with 30 courses in January 2007 to test its functionality. By August 2007, the Course Resources Tool

was integrated automatically into all Blackboard courses. UNCG has more than 1,000 courses in Blackboard; it was not expected that liaisons would assign resources for every course, especially if a course had neither a relevant resource nor a research component. It was, however, expected that liaisons would focus on the most relevant resources, usually the top three or four for a discipline or an area of study, and integrate those with the most obvious courses. Some courses for which instruction was regularly provided would have an even higher level of integration.

The project group learned several lessons from the initial phase. First, students had difficulty navigating to the Course Resources Tool because it could not be made into a default link on the left navigation menu for each course. Faculty had to add a link to the tool in the left menu, or students had to navigate to the Tools section of the Blackboard course space and then scroll down to the Course Resources Tool. Eventually, the Blackboard administrator created an administrative tool that allowed librarians to add the link to the default left menu, but there was some concern that this could infringe on the authority of the faculty member and their course space within Blackboard, especially if the link was added after the beginning of the semester. If the subject specialist librarian did not place the tool on the left navigation menu, the faculty member was asked to add the link.

Because the tool is related to semester-specific courses, librarians must associate resources at the beginning of each semester—an effort that can be time consuming during the busiest periods. Many librarians are enthusiastic about the project; however, several individuals have mentioned that it can be difficult to remember to populate the tool. In addition, some librarians have mentioned that they forget how to use the administrative interface from one semester to the next. The administrative interface is relatively easy to use, but infrequent use can be a problem for becoming proficient with any tool (see Figure 2). To assist with this process, a guide for the administrative interface and a plan to offer a more definitive timeline for the population of the tool were created. It is understood that the process needs to be made as easy as possible rather than assuming the project is a high priority for everyone.
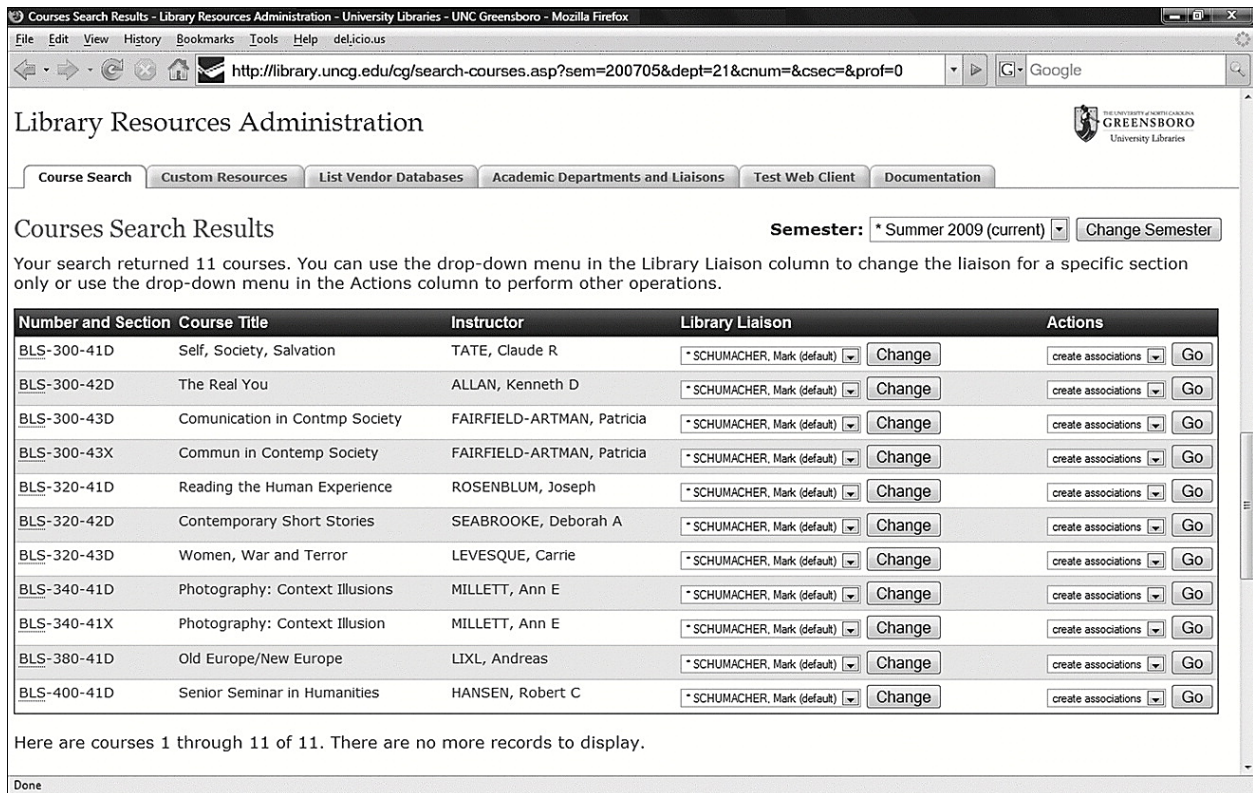
FIGURE 2 Main screen of Course Resource Tool's administrative interface.

Some librarians expressed concern that the faculty or administration might assume that the tool could replace library instruction; they were reassured that the goal for the tool is to ensure that students are using the "best of the best" library resources, not to replace course integrated instruction. Because the UNCG has a strong tradition of library instruction, there has not been a decrease in the number of classes overall. Certainly no faculty members have declined offers of instruction because of the availability of the resources tool. As such, these librarians were assured that the Course Resources Tool would serve as a supplement to instruction efforts. Nevertheless, as the tool's popularity increases, its effect on library instruction may need to be assessed.

Finally, because the tool is associated with active courses, only people enrolled in a course are able to see the tool in action; the subject specialist librarians are able to see the resources only through the administrative interface. Some project members were made course builders in specific courses; thus the tool in its "native environment" was able to better demonstrated. Other librarians could be added as course builders to access the tool, but each librarian would need the permission of the instructor for each course. Despite the challenges encountered, the Course Resources Tool has received a positive response from UNCG's campus community. In moving to the next stage of the project, each of these challenges was considered and an attempt was made to learn from them.

SECOND STAGE: THE PORTAL

Initial efforts at integrating library resources with the Blackboard CMS focused on integration at the course micro-level, but another goal was to benefit from information about individual students with the intent of pushing library resources appropriate to their majors. It was decided that the most logical place for this portal would be the Library tab within Blackboard. The original Library tab, available as a separate tab at the top of the default Blackboard homepage along with Courses and Organizations, directed individuals to the main library homepage. It was decided that a link to the library homepage was unhelpful, as it would not provide the level of customization required. Delivering portal content based on student majors was a logical next step to supplement the Course Resources Tool (see Figure 3).

FIGURE 3 UNCG's Blackboard portal for undeclared majors.

To create the portal, two main pieces of information were acquired: first, the status of the individual logging in (i.e., faculty, student, or staff) and second, the declared majors or areas of study of the students. Faculty and staff members see a generic screen with a link to the library catalog and other tools. Students, on the other hand, see library resources chosen by our subject specialist librarians and geared toward their specific major (see Figure 4). For example, an education major logged into Blackboard would have links to ERIC and Education Index. Subject specialists could choose to display any of the databases, external Web sites, or links to library Web pages, such as a department's subject guide—a static HTML page created by the subject specialist librarians and available for each department. [2]

FIGURE 4 UNCG's Blackboard portal for political science majors.

In addition, in the right navigation menu, a list of the student's current courses generated by our original product, the Course Resources Tool, was provided. In the portal, the tool becomes a smaller, though equally important, widget, providing a list of the student's courses, links to associated resources, and direct links to any online reserve materials for each class. Students are, therefore, able to access customized resources at multiple levels of integration. If they are political science majors enrolled in an English course, they will see resources for their major and specific resources necessary for their English assignments (see Figure 4). Below the course list, space is provided for subject specialists to push other types of resources such as tutorials or citation guides specific to the needs of the major.

Using a Microsoft Live Messenger widget, tiered chat access is provided within the portal. First the subject specialist's main instant messaging account is displayed. If the subject specialist librarian is not online, the student has access to the general reference instant messaging service called Irma Minerva. Finally, if the student is accessing Blackboard during hours for which virtual reference services are not provided, the widget will become a form that sends an e-mail directly to the subject specialist librarian.

Although it would be nice to have customization for faculty and staff as well, pulling data about an individual's employing department from Banner 8 would have been difficult. The generic faculty portal provides links to the catalog, the catalog's new items list, the database page, and to the generic chat account (see Figure 5). On the left navigation menu, additional links, such as the book request form and the list of subject specialist librarians by department, are provided.
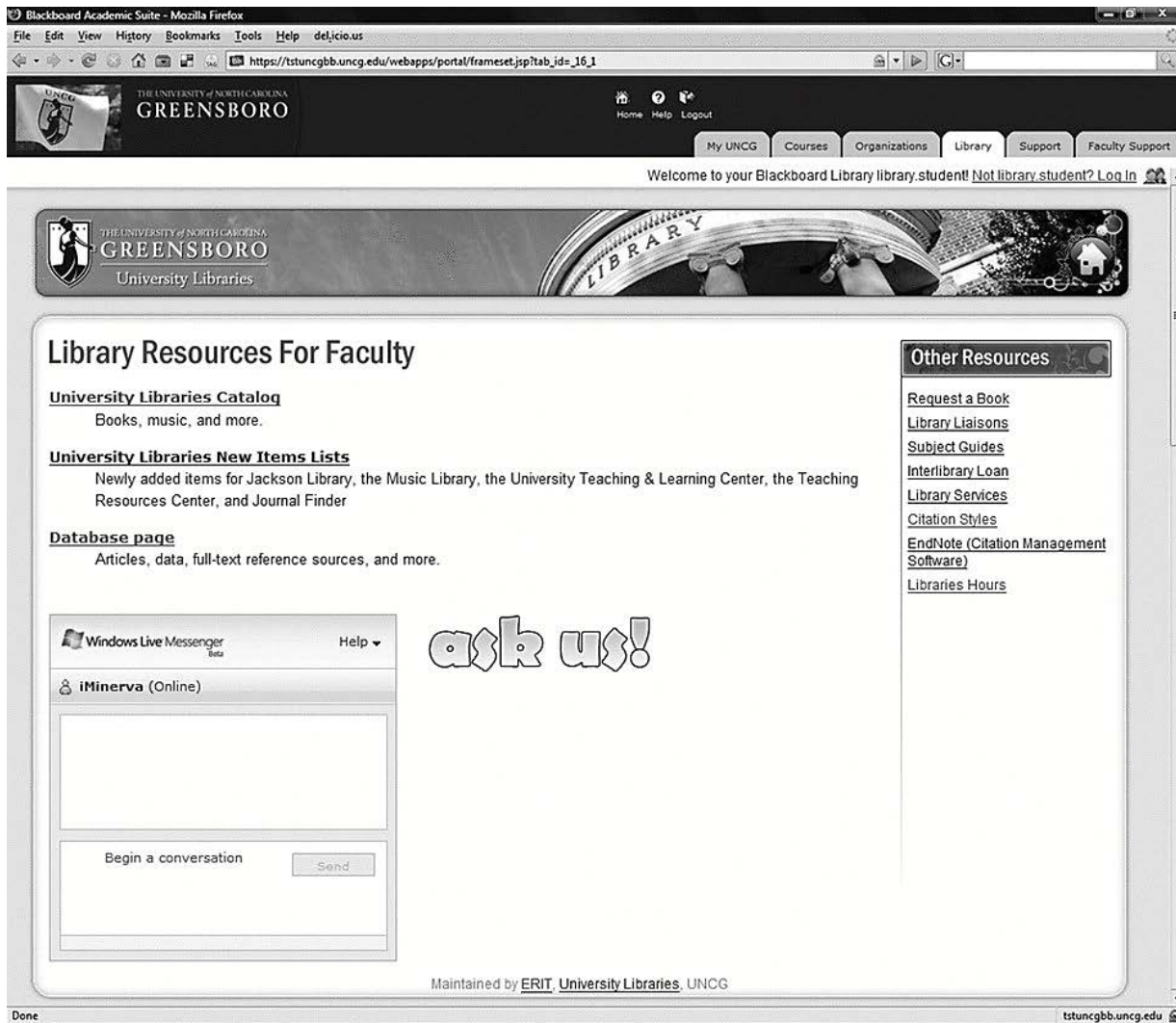
FIGURE 5 UNCG's Blackboard portal for faculty.

Like the Course Resources Tool, the Library Resources Portal was primarily built upon a number of Microsoft technologies. The application is written in ASP.NET 2.0 and uses multiple SQL Server 2000 databases. Web services are carried out via both XML and JSON/JavaScript; both are methods through which different computers or networks are able to share data across platforms. As a result, library information can be passed between the Blackboard and University Libraries Web servers simultaneously, even with an individual logging only into their Blackboard account. Instant messaging is carried out via Microsoft's Live Messenger, accessible itself through JSON Web services.

In contrast to the Course Resources tool, the Library Resources Portal resides on a University Libraries Web server instead of within Blackboard. Through several security measures, access to the application is limited to users logged into Blackboard, allowing traffic to flow freely through the proxy server for requests originating from the portal. It is already known that the user is

affiliated with the university through their Blackboard credentials, and as a result, the need for double authentication is eliminated.

When a user selects the "Library Resources" tab in Blackboard, a number of triggers and queries pass between the Blackboard server and library resources application using XML Web services. First, the libraries' application collects the user's login information from this initial request and checks with Blackboard to be certain the user is logged in. Upon confirmation, the application queries for information regarding the user's status (student, faculty, or staff). Then, the libraries' application begins assembling content areas based on user status.

First, Blackboard indicates to the application that the user is a student. Next, using an SQL server database containing an extract from Banner 8, the university's student information system, Blackboard collects information regarding the student's major. Using another query, it pulls in the online resources associated with that particular major. These resources include databases, tutorials, Web sites, and the contact information for the subject specialist librarian.

The contact information is then supplemented with a connection to the subject specialist librarian's Microsoft Live Messenger client through a customized widget. At the time of development, Microsoft was the only instant messager (IM) provider that allowed the querying of a user's online presence through an application programming interface (API), which defines parameters within which an application may request data or services from a data store. As a result, Live Messenger was the only real option in building the widget. This ability is central to enabling the multiple layers of IM contact through multiple JSON requests via the Microsoft API.

In summer 2008, the training of subject specialist librarians to use the administrative interface to push resources into the Library Resources Portal began. The portal was launched in September 2008 for all users of Blackboard as a default tab within UNCG's version of Blackboard.

Because of the launch's timing, a systematic outreach campaign in the first year was not conducted. Instead, subject librarians were encouraged to contact their departments to advertise the new tab. Despite the lack of formal promotion, a steady increase has been seen in the use of the Library Resources Portal. From January to May 2009, the portal had 10,068 visitors, of which 6,385 (63 percent) were return viewings. These statistics indicate that users are returning to the portal. In addition, comparing the number of page views with the page views of the primary library Web site reveals that the Library Resources Portal has become one of the ten most visited pages, despite its short existence. It is not expected that the Library Resources Portal will replace the library Web site completely because the portal lacks many of the detailed descriptions and supplemental information available on the library Web site. Nevertheless, the portal allows the delivery of key resources to students without requiring that they negotiate the larger library Web site.

An increase is beginning to be seen in the use of the chat widget and e-mail system, which can be tracked because the subject line for any chat or e-mail indicates "From Blackboard Library." The first-year instruction coordinator, who is also the librarian for students without a major and for interdisciplinary majors, had more than 30 e-mails over the academic year after the launch of the portal in September 2008. Other subject specialist librarians have also received e-mails and chats, though fewer than the instruction coordinator. Once the system becomes more established, it will be helpful to compare the number of e-mails arriving through Blackboard to the number of e-mails arriving through the library's e-mail form to see if students prefer one system over the other.

The primary difficulty with the success of the Library Resources Portal has been finding the most useful data to pull from Banner 8, UNCG's student information system. Our interdisciplinary majors, such as environmental studies, are often lumped together in a generic major entitled "Special Programs." In addition, many students are double majors, but which major will be given priority and be displayed within the portal cannot be controlled. These challenges are being addressed; none are stumbling blocks to the overall success of the project. The tool will not be perfect, but hopefully, it will be useful for the majority of patrons. According to Tim O'Reilly (2005), Web 2.0 technologies are in "perpetual beta," constantly evolving based on steady input from users. Likewise, the Library Resource Portal is permanently under construction.

Because of the large number of both database and Web services requests, the response time in the portal is longer than desired, taking about three seconds for the screen to fully load. Several smaller pieces of functionality are to be moved to A-based Web services, which will result in their loading only upon request as opposed to the entire page loading as a whole.

Compared with the Course Resources Tool, the portal has been less time-intensive for subject librarians. The Course Resources Tool requires the updating of resources at the beginning of each semester, while the portal generally requires that resources be associated once. It is assumed that the primary databases associated with particular majors will not change frequently; unless a database is dropped or changes focus, it will remain a top resource within a field. As a result, the portal needs to be populated infrequently.

A promotional campaign is expected to begin in fall 2009. This will be an excellent time to begin promotions after having a year to deal with technical issues such as the Banner 8 extract of student majors, ensuring the portal is populated for all majors, and training subject specialist librarians on the administrative interface of the tool.

THE FUTURE

A major question facing this project has been how to assess its use and functionality. The page-view statistics are certainly a starting point for gathering data on the portal's use, and statistics on chats and e-mails can continue to be gathered. As more data is collected, comparisons of use

over time can begin to be made. The increase or decrease in traffic will be one indicator of the effectiveness of the tool and its usefulness to students.

Other possibilities for assessment include usability studies of the interface to see if its functions are intuitive to students. Also, a survey of our campus community will be conducted to determine awareness of the tool and whether users find it to be effective and helpful. The plan is to model this survey on the one created by Brigham Young University to assess the usefulness of their Blackboard integration efforts (Washburn 2008). In the next academic year, possibilities for additional assessment techniques will be examined.

Several related projects are also under development, including the possibility of creating a "Rate My Resources" system, in which students have the ability to rate specific databases using a star rating system similar to those used by major Web sites like Netflix and Amazon. This will allow students to assess the usefulness of specific resources and will be helpful to other students who might use the rating as a guide for beginning their research.

While, as of this writing, Microsoft's Live Messenger remains the only IM option that allows for the querying of a user's online presence, the possibility of changing this widget to Google Talk is being considered. UNCG is now using the Google's Apps for Education suite of tools for student e-mail. Because all students have automatic access to Google Talk through Gmail, it would prove to be a more universal option for users. While Microsoft provides for presence usage through a simple, Web services-based API, Google relies upon extensions in the extensible messaging and presence protocol. Although this is an excellent communications protocol for building client applications, it is far too robust and complicated to meet the needs of this university, and as a result, the creation of a more elegant and simple solution that replicates current functionality is being considered.

An assignment calculator is also in the process of being created, which will be based on University of Minnesota's Assignment Calculator (http://www.lib.umn.edu/help/calculator/). This tool allows students to input start and due dates for specific assignments. The student receives a schedule for accomplishing the assignment in a timely and efficient manner and links to databases and other helpful resources. It is uncertain how this could be implemented within the Library Resources Portal in a way that would take the most advantage of the aggregate data, but the basic tool is currently under development, and those possibilities will be investigated later.

Finally, the creation of a mobile application that will use data from the Course Resources Tool and the portal is being investigated. While university and public libraries have been harnessing the possibilities for creating mobile applications of their catalog interfaces, none have examined the possibility of pushing customized resources to the mobile user. Hopefully this project will become a reality within the next academic year. Its success will be a tremendous step forward,

placing the library within the daily activities of users rather than passively waiting until they visit our library Web sites.

Notes

1. Some schools have started using the Blackboard Building Blocks to integrate with specific courses (Washburn 2008). While these Building Blocks are excellent tools for integration, there are limitations on the degree of customization. Washburn notes that the Building Block could display only one HTML Web page for each department, even if there are multiples pages available. The goal here was to push specific resource links to the course level instead of our subject-specific HTML Web pages. As such, the Building Blocks would not have been robust enough for the purposes of this work.

2. The static HTML subject guides are legacy instruction tools at UNCG. Every department has a subject guide, and some departments have many course guides for individual courses, which are often used as outlines for library instruction sessions. The subject and course guides are well used and relatively well maintained. The goal is not to replace them, but to highlight the best resources from these pages—three to four resources—and integrate them with the CMS.

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