Introduction

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The learning management system (LMS) is central to the educational experience for both students and faculty. Not simply a repository of completed assignments, it is also a space where learning takes place directly, through modules, discussion boards, assignments, quizzes, Learning Tools Interoperability (LTI) integrations, and many other tools. For online and distance students, the LMS is frequently the *only* place where this learning happens.

For all its activity, the functionality of the LMS is rapidly evolving. With this evolution are new tools and methods to bring library services and resources into the place where courses "live." Integration in the LMS provides the library with a front seat to student learning and a vital way to integrate in the process.

There are a wide variety of learning management systems, and it's certain that by the time this work is published there will be even more. However, at the time of this writing, five of the most popular options are Desire2Learn's Brightspace, Blackboard Learn, Instructure's Canvas, Sakai, and Moodle. The LTI integration discussed in this report can be implemented in any one of these systems. Indeed, most systems currently allow for LTI integration, which is the primary way that outside tools and the LMS communicate with each other. Though the look and feel of Moodle integration, for instance, will be different from the Canvas integration, the content remains the same.

Integration History

Integration in the LMS is not a new thing at Penn State. In fact, the Penn State University Libraries were quite innovative and successful in establishing a strong presence within the ANGEL learning management system.

This was accomplished over time through extensive customization of ANGEL by the development support team in Penn State's central IT organization. Three main integration points were established: course reserves; guides (course and subject); and later in the product life cycle, integration with Ask a Librarian, our virtual reference service. The key innovation with these integrations was the ability for librarians to connect guides on the library's website to ANGEL courses without an instructor's involvement.

It took a coordinated effort to make this work. The ANGEL team created a custom role in ANGEL for Librarian. Librarians who were granted this role were given privileges to associate distinct URLs for research and course guides with specific courses and sections in ANGEL. To do so, they needed to obtain the exact course abbreviation to use as the connection point. These were not standardized at the time.

A popular feature was the ability for a librarian to link a guide to an entire campus location, college, department, or single class section and to limit access if desired. A generic guide was often provided at a campus location level to provide basic information literacy information for that location. All library content appeared under a tab called Penn State Library Tools. By today's usability standards, this link was poorly placed under a higher-level tab, and students often didn't realize it was available at all.

In addition to guide integration, the library collaborated with ANGEL developers to integrate course reserves reading lists. This was difficult to implement accurately because various sections of a course could have been taught by separate instructors who could each have unique reserve reading lists.

As the libraries' use of virtual reference tools evolved over time, various links to the virtual chat

services were implemented within ANGEL. This was the simplest of all three of the integrations since no course specific connection needed to be made.

These integrations provided listings of library resources within ANGEL and linked out of ANGEL to the specific library content. While the approach was innovative at the time, user experience testing in recent years showed that students were often confused by jumping between the LMS, the library website, database resources, and so on. They wanted a singular experience within their primary system—the LMS.

In the spring of 2015, Penn State began the process of piloting the learning management system Canvas for potential implementation. ANGEL was scheduled to reach end-of-life in December of 2017. As the university as a whole began assessing its learning management system needs, the University Libraries decided to take a proactive approach to our own integration within the final project. At that time, the authors of this report came together and proposed a working group to improve the integration of the University Libraries and the Penn State LMS, which was likely to be Canvas.

This team was charged to provide overall vision and strategy for libraries presence in the LMS. It planned, oversaw, and supported initiatives to integrate library resources within the LMS and market these library resources to course designers and instructors. It also collected stakeholder feedback in order to inform decisions.

This issue of *Library Technology Reports* will provide a case study in the transition from one LMS to another, addressing our navigation of this process, as well as providing recommendations and best practices for other institutions that are in the process of integrating library resources into their own LMSs.