

Automating Student Information between SIS and LMS

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Table of Contents

Abstract	4
Problem Statement	5
Background and Research	6
Strategic Priorities	6
Student Systems	8
Data Analysis	13
Live Automation & Complete Integration	14
Data Integrity	14
User Experience	15
Technical Approach and Process Improvement	16
Available Solutions	17
Available Middleware	18
Other Learning Management Systems	21
Recommendation	22
Solution Development	23
Assumptions and Dependencies	23
Implementation Details	24
Technical Architecture	25
Project Management	28
Business Case and Financial Analysis	31
Executive Summary	31
Cost	32
Financial Return	33
Risk Assessment	33

AUTOMATING STUDENT INFORMATION BETWEEN SIS AND LMS	3
Measurement	36
Ethics	36
Registration Data Inconsistencies	36
Grades	37
Conclusion	38
References	39

Abstract

Ellucian's Intelligent Learning Platform (ILP) is an academic enterprise platform product, which creates a live connection between Ellucian's Student Information System (SIS) and a school's Learning Management System (LMS), while extending additional Ellucian product offerings such as the Ellucian Portal, and the Ellucian Mobile App.

Georgetown University uses Banner, as their SIS, and Canvas by Instructure, as their LMS. The infrastructure at the University does not currently have an integration between these two systems, creating a gap in the synchronization of a student's academic information. This paper is proposing that Georgetown implement the ILP to achieve the following: live data integration, improved business processes, reduced customizations, diminished data entry errors, and an enhanced user experience.

The paper explains the functions of an SIS and LMS, and the various needs for a modern solution based on the current issues faced by students, faculty, as well as the University's information technology team, and registration offices. This paper will outline how the ILP implementation answers these needs, the timeline and plan for implementation, the risks associated, and the return on investment.

Keywords: LMS (Learning Management System), SIS (Student Information System), ILP (Intelligent Learning Platform), Ellucian, Banner, Canvas by Instructure, Ellucian Mobile App.

Automating Student Information between SIS and LMS

Problem Statement

Georgetown University is at a crossroads with its Student Information System (SIS), Banner by Ellucian. University Information Systems (UIS), the campus technology department, has worked to update Banner to the most recent version, Banner 9. For years, the university's Learning Management System (LMS) has been provided by Blackboard. Recently, however, Georgetown began its transition to the modern LMS, Canvas, with a complete deployment finalizing in December 2019. Both Banner and the LMS are integral systems to the academic requirements of the institution, as they house all student information and allow teaching and learning to take place. However, as critical as these systems are, they continue to lack basic functionality that is vital to the everyday needs of students, faculty, and staff.

Currently, Banner and Canvas lack a live integration which prohibits the automated provisioning of user and course data, including adding new users, assigning faculty and students to courses, cross-listing courses, removing those students who have dropped courses, and synchronizing midterm and final grades. The current setup requires the use of custom, in-house developed scripts and scheduled batch uploads, to allow Georgetown to process the enrollment updates. This causes delays in data flows and data disparities between both systems, plus extra effort from faculty and staff to sustain those inconsistencies. Georgetown faculty, for instance, are required to update grades in two separate places: the LMS and then the SIS web-based portal, myAccess, for midterm and final grades. This increases the likelihood of data entry errors and grade submission delays, which can further dampen final registration processes to close term.

In addition to system inefficiencies, Georgetown currently spends money on manpower for all of these customizations and manual processes that would be automated with the Intelligent

Learning Platform (ILP), a middle-tier module provided by Ellucian that establishes a live connection between an SIS and LMS. The goal of this project is to continue to promote the University's strategic priorities by modernizing student systems, to reduce inefficiencies and enhance the user experience.

Background and Research

Established in 1789, Washington, DC, Georgetown University is the oldest Jesuit and Catholic University in the United States. Georgetown is a private, non-profit school that has nearly 7,500 undergraduate and more than 12,000 graduate students enrolled in nine schools (Statistics from Fall 2017 semester) (Georgetown Key Facts, n.d.).

Strategic Priorities

Georgetown's primary sources of funding are derived from student's tuition and fees, followed by private gifts, grants, and contracts. As one of the leading academic and research institutions in the world, Georgetown places financial priority on expenses related to Instruction, Academic Support, and Research. In fact, the 2015 study by The Integrated Postsecondary Education Data System (IPEDS) shows these top three categories make up for 70% of the University's core expenses per full time enrollment (FTE). For Georgetown, this displays the importance that technology resources play to support instruction.

Figure 16. Percent distribution of core revenues, by source: Fiscal year 2015

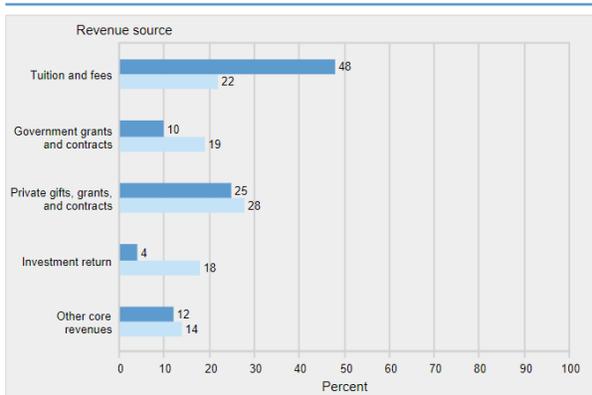


Figure 17. Core expenses per FTE enrollment, by function: Fiscal year 2015

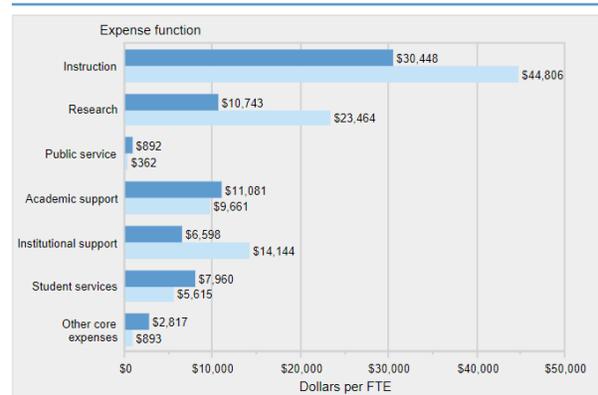


Figure 1. Revenue and Expenses per Full-Time Enrollment (FTE). IPEDS 2015, p. 7

Expense Categories

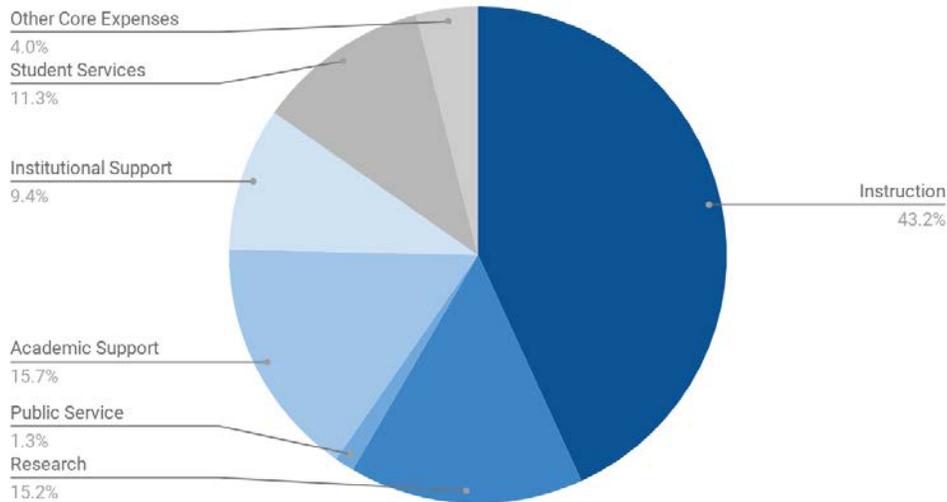


Figure 2. Georgetown expense categories. IPEDS 2015, p. 7

Technology Strategic Priorities. UIS shares the university’s priorities in their efforts to sustain the academic infrastructure. UIS has developed a quadrant of four strategic priorities to address the needs of infrastructure modernization, academic enterprise services, organizational optimization, and service excellence.

Specifically related to this project, the department's infrastructure modernization priorities focuses on extending cloud-based services and enhancing its mobile app offering. In fact, in the past year, UIS has mandated that all custom applications become updated to modern, cloud-based systems wherever possible.¹ Moreover, UIS seeks to excel in their areas of service management, student systems, and compliance. This paper will address these priorities through the proposal of the ILP module. Table 1 defines all of UIS' priorities in detail.

Table 1

UIS' Four Strategic Priorities

1. Infrastructure modernization <ol style="list-style-type: none"> a. Verizon project b. Laurel Data Center (LDC) c. Cloud architecture d. Mobile apps e. Infrastructure as a service 	2. Value for the academic enterprise <ol style="list-style-type: none"> a. Web communications b. Shared services c. Internet of Things (IoT) d. Machine learning e. Artificial intelligence
3. Organizational optimization <ol style="list-style-type: none"> a. Policy b. Finance c. Governance d. Talent management e. Communications 	4. Culture of service excellence <ol style="list-style-type: none"> a. GU360 b. Service management c. Student systems d. Compliance e. Research f. Special projects

Note. Created with data from <https://uis.georgetown.edu/strategy>, 2018

Student Systems

Student Information System. An SIS manages student data, including but not limited to registering students in courses, managing grades, transcripts, and other student academic data (Educause, 2018). At Georgetown, the SIS is called Banner, and is one of the SIS solutions offered by Ellucian. Currently in version 8, UIS is in the process of updating to its latest version,

¹ Mark Wiest is an Director of Instructional and Academic Technologies at the Law Center. The Law Center is involved in a project with UIS, requiring Mark to attend meetings where the retirement of old technologies is regularly discussed as part of the bigger technology strategy.

Banner 9, which is in line with UIS' strategy of including cloud-based technology solutions. Within this upgrade, are additional opportunities that address UIS' strategic priorities, including service management and enhanced student systems. The Banner 9 project will also bring the release of the college's newest mobile app, Ellucian Mobile, another cloud-based solution provided by Ellucian. The mobile app will modernize the University's current product offering, by streamlining information between systems, as the app ties directly to the SIS, and enhancing the user experience with its features and modern interfaces. The project displays the University's initiatives to address the institutions goals.

Learning Management System. An LMS, is a collaborative platform used to manage online learning courses. Online learning management systems are typically used in the education and business sectors (getbridge.com, 2018). Together with the SIS, the LMS provides access for students and faculty to an online portal for academic tools and course materials. While the SIS is used for mostly administrative tasks such as registering for courses, billing, and tracking a student's degree progress, the LMS provides a centralized location for assignments, grades, learning tools and resources, communication platforms such as discussion boards and messaging systems, media and file sharing, and more.

For years, Georgetown has utilized Blackboard as their LMS solution, but in the Fall of 2017, the University announced its "two-year migration process" to Canvas, a cloud-based SaaS solution provided by Instructure (Canvas Transition, n.d.). The decision to transition to Canvas was equally focused on UIS' strategic priorities, as Canvas offers the cloud-based solutions and streamlined features many institutions seek. For the past 20 years, Blackboard has dominated the market reaching a record 70% of the market share in 2006, when it acquired its nearest competitor WebCT (Duffy, 2018). However, their efforts to address cloud platforms fell behind

other competitors, like Canvas. This year, Canvas edged Blackboard as the top LMS with 28% market share, or 1,218 institutions using Canvas to 1,216 for Blackboard (Duffy, 2018).

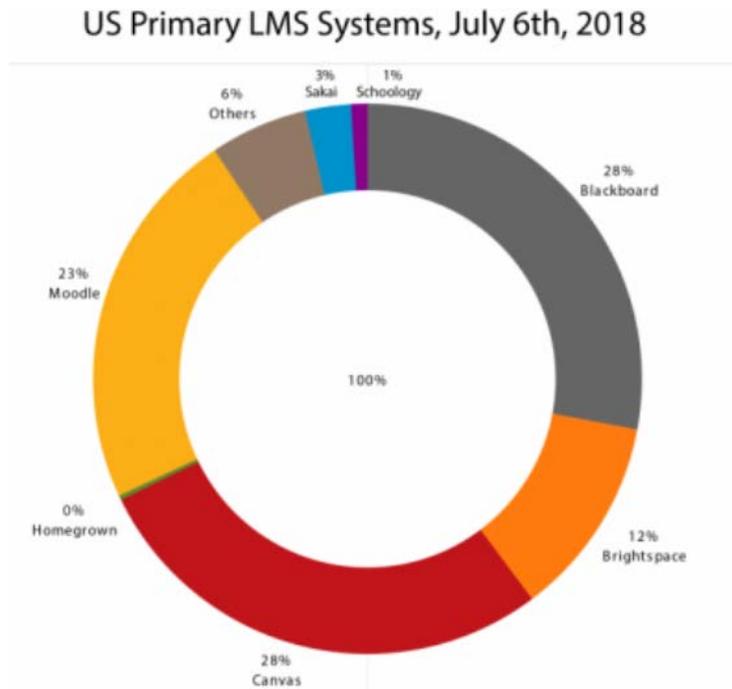


Figure 3. Image from “Canvas edges out Blackboard in LMS market share”, Duffy, 2018

SIS and LMS Relationship. In any environment, the SIS feeds critical academic enrollment information to the LMS, to allow the LMS to create the courses that are required for teaching and learning in a given term, and assign and grant access to the proper students and faculty to each course. In terms of Ellucian’s SIS, the data provisioned between Banner and a given LMS includes:

- User information
- Courses/sections
- Student enrollment
- Faculty assignments

Colleges and universities normally commence the process of opening courses and assigning instructors early on prior to a term’s start date. Students are then offered several weeks

to register for any course for the term in question, and are given the opportunity to change their schedule while registration is ongoing. During this time, faculty may also become reassigned to a course, removed from a course, or a course could be cancelled altogether. Even after registration is closed, most institutions will allow a student to withdraw from a class up to a certain date. All of these transactions are recorded by the SIS the instant they occur.

The criticality of such changes requires that the LMS equally reflect immediate changes as they are processed by the SIS. Without this communication established, a student may lack access to a course, which is especially critical if a student registers late and may already be behind on assignments, or provides a student with full view and access to a course he/she no longer is assigned to. A faculty member can equally experience issues if he/she is assigned to a course that was actually cancelled, or becomes reassigned to a different course. Students and faculty expect the information on the LMS is always reflecting all of the accuracies found in the SIS, and with all reason.

At Georgetown University, however, this live connection does not exist. Data from the SIS is actually provided to the LMS through feeds occurring three times a day, created out of custom scripts developed by the UIS team. While the data is at least available on a frequent basis, it still causes delays in access or reflecting accurate data in Canvas for students and faculty.

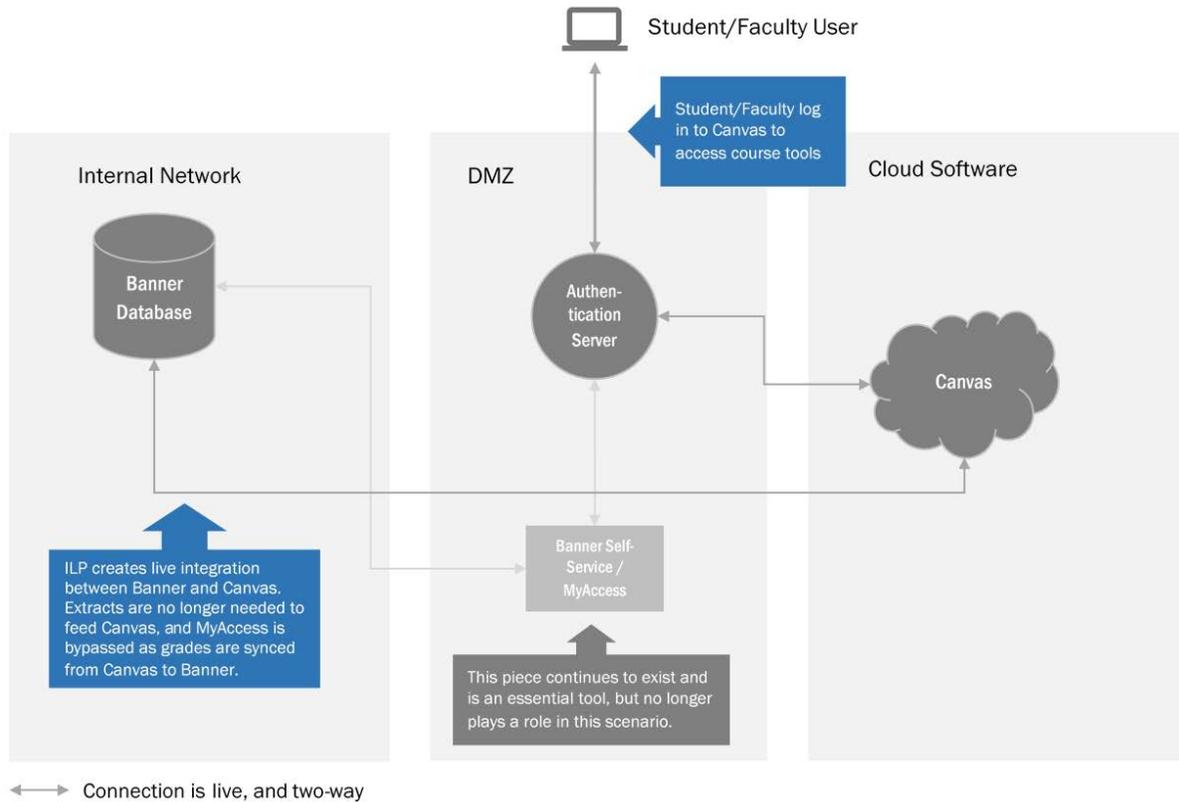


Figure 5. Diagram of high-level connection with ILP.

Data Analysis

Investing in the live integration between SIS and LMS will require staff at UIS to implement the technology, accordingly. While current technology exists to allow information to become available in Canvas, Georgetown is lagging behind the automated solutions available for this process to be performed more efficiently, timely, and effective. In adopting a solution, Georgetown benefits from:

- Live automation and complete integration, which is an important aspect for students and faculty;
- Data integrity, which is required by accredited institutions;
- Improved processes, which benefits business operations;

- Reduced customizations, which is a priority at Georgetown and often best practice for vendor-provided solutions; and
- Enhanced user experience, which increases user adoption and satisfaction.

Live Automation & Complete Integration

Technology is a key factor in a student's decision-making process while searching for a higher education institution to enroll at. A survey published by Ellucian, conducted by Wakefield Research in 2017, collected data from 1,000 U.S. students in regards to their personalized digital experiences and expectations. The study found that "87% of students said the tech savviness of colleges is important when applying" ("Students are Looking," 2017). Furthermore, it identified that "data-driven experiences [were] important and can only be delivered when institutions break down data silos. Equally important is making information easily accessible to students" (2017). While the report focuses heavily on ways colleges and universities can enhance students' digital experiences through personalization, the study reflects the importance that instant access, good data, facilitated communications, and unified portal experiences are to a student.

In a world where global technology leaders are offering consumers instant gratification with services like Amazon Prime, universities are equally feeling the pressures of adopting a similar framework to meet student demand of "an educational experience that is flexible, personalized, and real-time" (Salvato, 2018). With this thought process in mind, ensuring the most fundamental, academic systems are functioning at full capacity should be a priority to any institution, with a secondary priority falling on enhancing those experiences.

Data Integrity

Similarly, data accuracy will always be valued by any audience, including the institution itself. Nowadays, technology is being developed to aggregate and analyze data instantly to

provide insights and drive decisions for leaders across all organizations. Data is heavily protected through processes, policies, and technology infrastructure specifically to protect access and its integrity. In colleges and universities, integrity is emphasized in all aspects of their operations. Policies exist to ensure students adhere to standards of academic honesty and integrity, for instance. Thus, it can only be expected that a university upholds these same values with its data, and that it presents correct information in all places, especially as it relates to a student's academic history. With the current processes in place at Georgetown, the University faces the risk of reflecting data that is inconsistent between systems, or incorrect altogether.

Reduced Customizations

With the rise of consumer expectations related to technology, "IT personnel are stretched too thin to address the myriad support issues arising from disparate, legacy systems while at the same time, trying to provide constituents with quick resolutions" (Cronin, Kish, Suchak, & Walton, 2017). As a result, institutions are seeking for greater cloud-based solutions to help offload the work and meet student and staff demands. At Georgetown, UIS is facing a similar challenge and is seeking to abandon custom processes for delivered solutions, whenever possible. "Higher education institutions are starting to embrace cloud services to create efficiencies, reduce costs and ultimately improve the student (and staff) experience" (Cronin et al., 2017). It is inefficient and no longer sustainable for institutions to be manually producing custom processes that can easily be replaced with solutions that are provided by recognized and trusted vendors, and equally enhanced and maintained by those experts.

User Experience

Student expectations of technology are primarily driven by ease of use, convenience, constant access, and overall user experience. "The bar has been raised for Higher Education

institutions. Where colleges and universities once built systems around business processes, they now need to focus on the student experience” (Salvato, 2018). Georgetown identified this need, not only for their students, but for all of their constituents campus-wide. With the launch of their GU360 platform, UIS was on a mission to provide a unified experience for students, faculty, and staff “built from the outset with end-users in mind” (“About Georgetown 360”). Moreover, in their upcoming delivery of the Ellucian Mobile app, the University seeks to embrace cloud solutions, integrated systems, and enhanced user experiences. Compared to their current in-house app, the app provides students with a more modern and usable interface to the school’s resources, including a direct connection to information hosted in the SIS. It only makes sense that Georgetown follow this similar goal to continue providing its users unified and enhanced user experiences across all of its platforms.

Technical Approach and Process Improvement

At Georgetown, the current SIS and LMS environment requires the use of custom scripts and batch processes to update student information from Banner into Canvas. While the current setup functions, it fails to provide a live data feed, which produces a multitude of shortcomings as presented in the section above. Furthermore, in this current environment, no connection exists to feed Banner data *from* Canvas for grade synchronization, thereby relying on faculty to perform accurate, dual entry in both the LMS, and then again in the SIS.

The purpose of a proposed solution is to create a live connection between Banner and Canvas to enhance the integration between SIS and LMS at Georgetown University. With the proposal of such solution, Georgetown will achieve:

- Live data integration
- Improved business processes

- Reduced customizations
- Diminished data entry errors
- Enhanced user experience

Available Solutions

The purpose of an LMS is to provide the student with a gateway to all of their course-related tools and information. In 2016, Gartner's Complete Guide to Higher Education LMS Market, defined a list of commonly required features by institutions, with a distinction on enterprise LMSs often needing "[integration] with the student information system (SIS), and in some cases, institutional CRM to enable the passing back and forth of roster information and grades between the SIS and LMS" (Morgan, 2017). Furthermore, Kasim and Khalid (2016), identified the most important characteristics of an LMS and proposed that "if the LMS system is integrated with other systems such as e-portfolios, Web 2.0, email systems, mobile learning services and other systems used at universities, it can facilitate students' learning, and facilitate students to use the LMS" (Kasim & Khalid, 2016). Moreover, they concluded the most important characteristic as ensuring an LMS is "easy to navigate and effective in managing content and users" (Kasim & Khalid, 2016). The authors further noted that student satisfaction is impacted by the integration of such components:

"The crucial factor that impacts on student satisfaction is that the features available in an LMS meet their needs and facilitate its use. For example, the integration of an e-learning system with other complementary systems is a strength of an e-learning system, for example an information management system provides systematic and interactive elements that can easily be managed in the LMS and supported by its flexibility and

student-centeredness, and it is thus able to provide a more meaningful learning experiences for students” (Kasim & Khalid, 2016).

Thus, we can argue that aspects of an effective and efficient LMS include timely and accurate information coming from a constant interface between LMS and SIS.

Available Middleware

Relying on this automation requires a middleware component between LMS and SIS. This can be performed in various ways, either through custom development or through product offerings by a third-party vendor, or the LMS or SIS vendor.

MuleSoft. One of the third-party solutions is MuleSoft. MuleSoft provides an integration platform to “maximize [an institution’s] investment in applications such as Blackboard, Banner, and Workday by effortlessly connecting them to...existing systems” (“Higher education solutions”, 2018). Through their Anypoint Platform, MuleSoft offers the ability to create an application network through API-led connectivity to allow all systems to communicate with each other. There is little information, however, on how this would integrate well with Banner and Canvas, and what type of integration that would create. Ellucian Customer Support addresses it is not a commonly chosen solution by their clients, and that it would likely require additional customizations for the integration to work (C. Hughes, personal communication, December 6, 2018). While further research could uncover a possibility, there are several risks posed by such solution.

Introducing another vendor usually poses risks in compatibility and responsibility. When a piece of the architecture needs troubleshooting, it becomes troublesome for information technology teams to get support from a vendor, as knowledge may be lacking on a side, or the

responsibility may be offloaded to the other vendor. A lower risk will always exist when the vendor itself extends their own solutions to create new functions.

Ellucian's BIEL. Ellucian has provided the technology to automate this data integration in previous years through their current component named, Banner Integration for eLearning (BIEL). Such technology provided the ability to synchronize an institution's "Banner database with a third-party learning management system (LMS)...[by allowing] an LMS to synchronize person, course, student enrollment, and faculty assignment data with Banner" (*Banner Integration for eLearning Handbook*, 2017).

That technology, however, fell short of the data options available for communication between systems. In fact, BIEL was initially developed with Blackboard in mind, and was later extended to support rSmart Sakai, but "Canvas was never a supported LMS" (B. Adams, personal communication, November 20, 2018). Certainly, an institution could extend the technology and adopt it to any LMS, but the work would require professional services from Ellucian, or custom development in-house (B. Adams, personal communication, November 20, 2018). Regardless, if a school opted for this solution, the institution would continue to find gaps in the integration, for instance this technology does not include a method to pass data back from the LMS to Banner, such as grades.

While the technology continues to be available and there are no defined plans for retiring such technology, Ellucian will no longer enhance the component. In 2015, Kirk Bunte, Product Manager at Ellucian, stated, "Banner Integration for eLearning has been in maintenance mode since last year. There are no plans to de-support the product and we continue to keep it technically current - we actually had a release of the product last month. There are no plans to enhance the functionality of Banner Integration for eLearning and ILP is the new and more

advanced integration product offered by Ellucian for LMS integration” (Faulkner, Epstein, & Bunte, 2015).

Ellucian’s ILP. Ellucian’s efforts have instead focused on the development and extension of their Intelligent Learning Platform (ILP), and their plans are to continue moving the product forward (B. Adams, personal communication, November 20, 2018). Moreover, Ellucian has extended its features to include more options than BIEL ever included, like providing a two-way connection between SIS and LMS, and equally reflecting important academic updates on the Ellucian Mobile app. Tamar Epstein, Senior Director of Product Management at Ellucian, mentions:

“ILP is a more advanced integration platform to enable LMS integrations with Banner. In addition to data synchronization (which you get with eLearning currently), it also enables two-way data exchanges with the LMS, and integration with other applications.

Here are some of the additional features that ILP provides:

- Synchronization in real time and bulk of terms, course sections, user, enrollments (this is similar to eLearning, only using more modern APIs)
- Cross-listed sections support (sections that are cross-listed in Banner are automatically merged in the LMS)
- Real-time midterm, final grades and LDA posting from the LMS into Banner
- Ellucian Portal integration with notifications, quizzes, assignments, forums, calendar integration, all with SSO
- Mobile integration with some of the same features listed above for portal
- APIs for extensibility or if you'd like to perform additional operations in the LMS” (Faulkner et al., 2015).

Other Learning Management Systems

Certainly, an alternate solution is to consider purchasing a new LMS that already contains this integration between Banner and the third-party solution, without the need of an additional middleware component requiring additional steps for implementation. However, it is highly likely such technology will be required when running two systems from different vendors. Regardless, at Georgetown, such option would be a greater disadvantage.

UIS' two-year LMS migration is expected to finalize in December 2019. ("Canvas Transition"). Searching for a new LMS with such a recent undertaking, and a massive project process, seems like an inefficient use of resources, and could pose additional unnecessary overhead that would result in larger pains than gains.

Such process requires a thorough search process involving all necessary stakeholders utilizing a committee to evaluate the "advantages and disadvantages of available software," enact a "decision-making process and selection criteria" and "apply [those] criteria to determine the most appropriate LMS, given the characteristics of [the] institution and its faculty and student body" (Wright et al., 2014). The process does not come without its share of challenges, including, but not limited to:

- "Lacking leadership, stakeholder involvement, or commitment to the process
- Institution-wide buy-in
- Thorough understanding of faculty requirements." (Wright et al., 2014)

Furthermore, the investment to purchase such system was substantial and the time and personnel investment to plan, migrate, and train has been significant. Thus, this option would not be a viable solution for Georgetown.

Recommendation

The recommended solution provides that Ellucian's updated ILP module be implemented at Georgetown University. The module is available for Beta release for institutions running both Banner and Canvas, piloting the course synchronization feature set, and later the grade synchronization feature, and integrations to Ellucian Portal and Ellucian Mobile, for schools that have such additional platforms in place. Georgetown can also feel confident knowing that the solution was developed with the specifications necessary to integrate Banner and Canvas. ILP "streamlines common teaching and learning tasks between administrative and learning management systems (LMS), making it easier for end users and institutions to seamlessly access data and manage information in real-time from within their administrative and academic systems" ("Ellucian Intelligent Learning Platform"). Specifically, ILP ("Ellucian," 2015):

- Reduces data management costs involved with managing Banner and Canvas data synchronization;
- Eliminates custom scripting and batch processing required by IT;
- Provides faculty and students with instant access to correct courses;
- Lowers support calls from faculty and/or students who do not see the most updated information in Canvas (i.e., correct course enrollment, dropped courses, changed usernames/names, updated email addresses);
- Grants faculty ability to enter grades in only one location, lowering the risk of data entry errors; and
- Enhances the overall user experience.

Solution Development

Assumptions and Dependencies

The project is dependent on the progress that Ellucian makes during their Beta testing with their select colleges and universities. Depending on the outcome, the general release of ILP may be delayed and therefore, push the timeframe for this project. However, Ellucian has already released this same feature set for another SIS/LMS combination--that of, Colleague ERP and Blackboard, as well as Banner and Blackboard. Therefore, there is a high level of confidence that Ellucian will also release ILP for Banner and Canvas. Their current roadmap similarly denotes this. The only concern is on Ellucian meeting their intended launch date for general release.

Furthermore, the project will require Georgetown to budget and allocate funds for the implementation of this project. This will include ensuring that the budget allows for consulting services to permit Ellucian to perform the implementation as a turnkey solution. In the event the budget is not allocated, however, Georgetown could provide the personnel resources to perform the implementation themselves, without requiring an additional financial investment on consulting services.

UIS will be required to dedicate time to the tasks outlined by Ellucian. While Ellucian will perform most of the work, there will still be key activities that the University will need to perform, including securing the hardware where some of the ILP components will reside, installing software dependencies, and securing and installing SSL certificates. Georgetown's networking staff will also be required to configure the University's firewall to allow specific servers to communicate through specific ports, and provide the consulting staff with VPN and server access to the necessary environments. Furthermore, Georgetown will need to provide a contact that will act as the Project Manager or project lead on behalf of the University.

It will be pertinent that Georgetown is strict about completing all of these activities on time, as provided by Ellucian's scope of work (SOW) and timeline documentation to avoid incurring time delay fees. Ellucian's policy states that clients agreeing to the timeline provided by their project manager will have a notification window of 15-30 calendar dates to reschedule, and assume a fee of 50% of the total anticipated fees for the scheduled services. A notice shorter than 15 days will enlist a 100% of the total anticipated fees².

ILP also relies on certain software versions and dependencies to undertake this project. Georgetown will need to ensure these are in place prior to contracting services, or budget additional funds and resources to allow these dependencies to be implemented.

Implementation Details

The plan proposes to contract Ellucian consultants to perform the implementation from start to finish. Georgetown University will still be required to provide key personnel resources to work with Ellucian during the discovery, implementation, testing, training, and go-live processes.

During the discovery process, Ellucian will identify any system dependencies required to continue with the installation of ILP. Overall, ILP requires specific Banner versions to be in place, an API, a messaging queue, an event provisioning queue, and a Canvas API. Each of these components require particular hardware and software specifications, and networking requirements.

Ellucian will provide a detailed SOW following the discovery of the current infrastructure in place. The team recommends that any dependencies that are not in place are

² Ellucian's contracts provide this statement in writing and was shared with Laredo College in May 2018; the statement is not found publically.

included in the SOW to allow Ellucian consultants to work on those tasks prior to the ILP configuration.

Following the discovery, Georgetown will need to acquire hardware, prepare the hardware with either Tomcat or Weblogic server applications, SSL certificates, and configure the network ports properly. The process will then continue to install any ILP dependencies, then configuring ILP to integrate with Georgetown's Banner and LMS environment. Finally, training and testing will occur to ensure everything is in place properly, before working in this same structure for the production environment.

Technical Architecture

The current architecture at Georgetown allows only a batch process synchronization between SIS and LMS. In UIS website, the division of Educational Technologies explains that "changes to the registrar's system are not immediately reflected in Canvas, and will be present by next business day," as well as, "once students begin to register for courses using the registrar's system, it can take anywhere from six to nine hours before their enrollments are reflected in Canvas," as a result of the lack of live integration ("I am teaching").

In the proposed solution, we seek to create this live connection between both systems to allow for instant access to all course-related information for both faculty and students, as well as diminish service calls to the Registrar's and UIS offices, eliminate further manual processes, and allow for data consistency.

The ILP component is a cloud-based service that permits the institution to configure their connections to Banner and Canvas to define where each system exists, and allow for that connection to be established. ILP requires minor applications to be installed and configured on the school's current environment to allow that communication. For instance, as referenced in

Figure 6, the institution must add the Banner Event Publisher (BEP) application on their internal network to allow Banner to feed events related to registration processes (1). Because the data is being fed directly from the database, the application sits behind the school's firewall on the internal network. That application then forwards the event details to a message queue located on the school's public network, the Demilitarized Zone (DMZ) (2). The ILP cloud-based solution, will then reach for those events from the school's public network (3) and send them to Canvas for consumption (4).

When the grades function becomes available, Canvas will feed all grades to ILP (1) to forward them to the message queue (2) for consumption by an API (3). The API will interface with the Banner database through a dedicated port to forward that information over the private network (4). All systems on the public networks will be secured through Secure Socket Layer (SSL) certificates for added security, though the information that is being sent over the network does not contain sensitive information such as social security numbers.

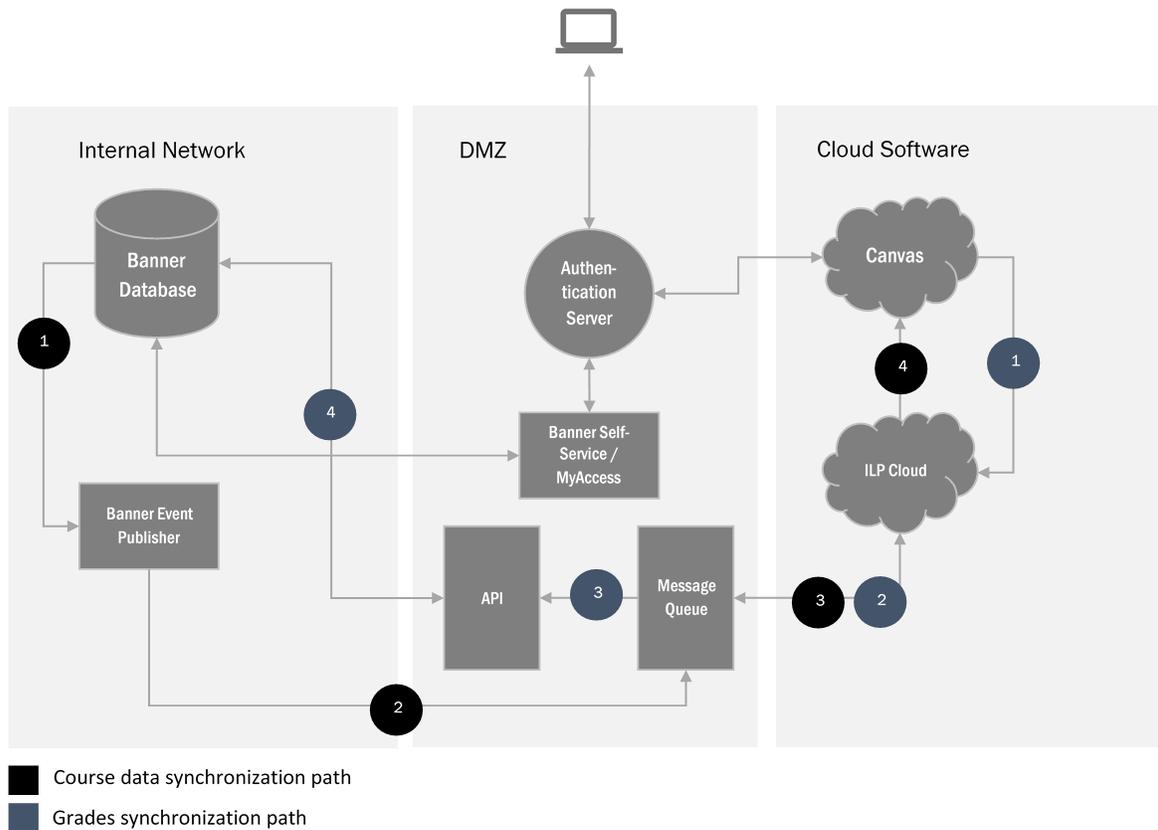


Figure 6. Technical architecture of ILP components.

All of the components presented above are requirements listed in Ellucian's ILP manual. This includes recommendations on the placement of each component in the school's networking architecture. However, further technical analysis and understanding of Georgetown's infrastructure may require variances on the technical architecture for ILP.

Hardware and Software Requirements. The BEP will need to be hosted on a Tomcat server, which can be virtualized if desired. While Ellucian supports Weblogic servers, the company has recommended utilizing Tomcat servers whenever possible, due to their ease of

implementation and administration³. The server will be Georgetown's internal network, and as a result, does not need to contain an SSL certificate.

The API and the messaging queue will also need to be hosted on a Tomcat server, which can similarly be virtualized if desired. The applications can run separately or on the same host, depending on the level of activity from the institution—if the institution expects a high level of registration-related transactions occurring on Banner, it is recommended the message queue has its own dedicated server. Both of these systems will need to be secured through an SSL and be protected behind a firewall on the school's public network, reachable only through dedicated ports provided by Ellucian.

Project Management

Timeline. The project will require five months from inception to completion of both the test and production environments. This time frame includes time allocated to allow Ellucian consultants to install the dependencies required before ILP is configured, as well as the kick-off and validation meetings, testing, go-live planning, and knowledge transfer sessions. A detailed list of the tasks to be accomplished and the estimated hours can be found in Table 2.⁴

Table 2

Project Tasks by Week

Allocation Week	Task	Estimated Hours
Week 1	Banner Middleware - Service Preparation Meeting, Technical Planning Call & Kick Off Call	4
Week 2	Banner Middleware - Validate Service Readiness	2
Week 3	Banner Student API installation - Test	8
Week 4	WebLogic Installation - Test	8

³ Notice of Ellucian's efforts to move away from Weblogic to Tomcat servers when possible was provided to Laredo College in a personal communication.

⁴ Work breakdown provided to Laredo College as a Beta school for ILP's Banner and Canvas implementation. Confidential details have been removed.

Week 4	Ellucian Messaging Service Installation w/SSL with ERP Integration and Validation - Test	6
Week 4	Banner Events Publisher Installation (BEP) - Test	8
Week 5	ILP Configuration – ILP Introduction	4
Week 5	Banner Student API installation- Production	8
Week 6	Banner Middleware - Production Readiness Check with client	1
Week 6	ILP - Service Discovery Call	1
Week 7	WebLogic Installation – Production	8
Week 7	Ellucian Messaging Service Installation w/SSL with ERP Integration and Validation – Production	6
Week 7	Banner Events Publisher Installation (BEP) - Production	8
Week 8	Banner Middleware - Production Turnover	1
Week 8	ILP - Service Readiness Validation	2
Week 9	ILP - Configuration Test Banner	11
Week 10	ILP Consulting – ILP Configuration	4
Week 11	ILP – Configuration Production Banner	11
Week 11	ILP - Configuration Turnover (remote)	1
Week 12	ILP - Go Live Planning	4

Stakeholders. Ellucian consultants will perform the work of implementing BEP, the message queue, and API, as well as performing all of their configurations, including those on the ILP cloud. Georgetown technical personnel will need to provide the consultants with the servers required to perform the software deployments and work with providing integration details, such as URLs, IPs, database names, usernames, and passwords, to perform the configurations.

The project will be dependent on key resources at Georgetown University, aside from the consultants that will be contracted from Ellucian. The following personnel roles will be required during the project process:

Table 3

Georgetown Stakeholder Roles and Responsibilities

Role	Responsibility
LMS Administrator	Coordination activities to help configure ILP, test data synchronization, and provide input on timeline.
ILP Administrator	Maintain and configure the settings for ILP to establish connection between SIS and LMS.
Project Lead	Coordinate activities between Ellucian and Georgetown.
Server Administrator	Prepare and configure servers with necessary hardware and software requirements.
SIS Administrator or Database Administrator (DBA)	Help with the prerequisite activities for ILP, including updating security roles and access to the Banner database.
Network Administrator	Provide Virtual Private Network (VPN) access to consultants and update firewall rules to establish necessary host and port connections.
Faculty Member	Will assist with testing through validation in the LMS.
Student	Will assist with testing through validation in the LMS.
Registrar Assistant	Will assist with testing by performing registration transactions that generate events to be consumed by BEP.
Executive Sponsor	Will drive the project by securing funding and permit the use of personnel resources.
UIS Director	Strategize to allocate personnel resources in project.

Business Case and Financial Analysis

Executive Summary

Georgetown University has a Learning Management System (Canvas) and a Student Information System (Banner) that handle academic and administrative functions respectively. These systems are vital to students for enrolling and paying for courses, tracking graduation progress, as well as retrieval and submission of course materials, grades, and communication with fellow students and instructors. The SIS and LMS are also vital to faculty and support staff for course management, communication with students, and tracking and entering grades.

Currently, students, faculty, and staff have to access the sites in two separate locations and use them to retrieve information such as grades. This causes duplication of grade entry for faculty and confusion among students who may be under the impression that their grades in Canvas are official. In addition, Banner's data feed only updates Canvas three times a day, causing a lag in enrollment data being available to students. Our solution to these and other issues is to implement the Intelligent Learning Platform (ILP) by our current vendor partner for Banner, Ellucian. This platform will connect both the SIS and LMS to establish a live integration, making information fed from the SIS to the LMS immediately available, and vice-versa. In addition, it allows for the enhancement of the school's latest mobile app release.

The immediate benefits to this implementation are a reduction in data management costs involved with managing Banner and Canvas data synchronization, elimination of custom scripting and batch processing required by IT, instant access to correct courses and student data for faculty and students, relief from support calls due to inaccurate or lagging data, and a single location for faculty to enter grades reducing the risk of data entry errors.

There are some risks involved with the ILP implementation. First, the ILP integration for Canvas is not fully built as of yet and we are relying on past integrations successes with other learning management systems to forecast a successful integration with Canvas. We plan to work with Ellucian to minimize these risk factors and ensure a positive outcome with the planned installation of the ILP. We estimate that the implementation will take five months from inception to completion with an estimated “Go Live” target of August 2019.

Cost

As of February 2018, the cost of the ILP Cloud software is \$20,625⁵, and is a recurring cost annually. The cost includes hosting services on Amazon Web Services (AWS), upgrades, maintenance, and support. Additional expenses will be incurred for contracting Ellucian consultants for the implementation. The cost per hour of an Ellucian consultant is \$250⁶. It is estimated the project will require a total of 107 hours, resulting in a total cost of \$26,750. Additional costs may be incurred if Georgetown faces other dependency or implementation roadblocks that will require additional consulting hours. Finally, Georgetown will need to acquire a total of four SSL certificates from a trusted Certificate Authority (CA), such as GoDaddy. Two certificates will be required for the test environment, and two others for the production environments. A set of certificates will secure the API, and the other set will secure the message queue. The total capital cost of this project is \$74,401.

Table 4

Project Overview Cost

Budget Item	Cost
ILP Annual Subscription Fee	\$ 20,625

⁵ Cost acquired from a contract provided to Laredo College.

⁶ Hourly rate acquired from contract prepared for Laredo College.

Ellucian Contract Services (107 hours at \$250/hour)	\$ 26,750
SSL Certificates (4 certificates at \$69/certificate)	\$ 276
Total Capital Cost	\$ 74,401

It is assumed Georgetown will not need to acquire additional hardware to run the small-scale applications needed to complete the communication bridge (i.e., API, BEP, and message queue), as these applications may run on existing hardware or have virtual servers created within a dedicated physical server host. As a result, these costs have not been calculated, and will need to be included if hardware is required. Furthermore, the cost does not include the additional hours required from Georgetown staff to dedicate to this project, as it is expected the scope will fall within their current job responsibilities.

Financial Return

While the investment is substantial, the benefits of the live integration will outweigh the one-time implementation cost, and the recurring annual cost for the ILP SaaS solution. As a non-profit institution, Georgetown seeks to achieve mission-oriented goals, rather than focus on financial gains from projects. In the case of the ILP project, our gains will be measured by the efficiencies created by installing a new platform, the buy-in from faculty and students, and the efficiencies that will cut down on time spent by UIS on custom scripts, answering help calls related to log in issues, and data that is not current. The University Registrar will further seek efficiencies in help-related calls, manual troubleshooting and re-synchronization of data, and delay in end-of-term processes.

Risk Assessment

Delayed General Release. Ellucian's development of the ILP module has been in effect since 2014. With such a large and diverse higher education base, Ellucian is required to develop

a strategic plan to release software to target each distinct environment. For instance, they have to consider the multiple Enterprise Resource Planning (ERP) solutions, as well as a wide range of LMSs.

Ellucian's development of ILP began with the Colleague ERP and until 2017, the organization worked to integrate ILP with Banner. All integrations were mainly focused on Blackboard, and it was not until 2018 that development began to interface with Canvas. Such integration is just at a Beta stage with a few select release schools working with Ellucian to test the system. It has not yet been determined, however, when the general release will become available for other schools. There is a risk that ILP will not be available for Georgetown until a later date, pushing the timeline forward.

Georgetown can decide either to accept the risk by allowing the releases to become available when they are ready, and therefore, shift the timeline as ILP becomes available for general release. Another potential solution, however, is to prepare the environment over time for the implementation of ILP. This will allow Georgetown to save funds from paying consulting hours to perform the entire implementation, and only pay for the hours required to finalize the installation and configuration.

Complex and Diverse Architectures. Due to the diversity of higher education institution software and hardware, integrations, and user needs, a client will always face the risk of implementation issues of a purchased software; often times, a client and vendor uncover these issues until the implementation is actually occurring. The issues that could arise as a result involve delays in the timeline, increases in budget expenses, and functionality discrepancies resulting from client expectations. It will be pertinent that Georgetown and Ellucian perform a thorough discovery process to identify any potential issues beforehand. The subsequent risk will

be on identifying obstacles that will require additional effort and tasks to be added into the project timeline. However, a high level of confidence exists due to Ellucian's extensive client base and experience in working with complex and diverse architectures. Still, Georgetown will need to ensure the timeline and budget accommodate for these potential contingencies.

Knowledge Transfer. Finally, while allocating funds to allow an external agency to perform the work provides Georgetown with an alleviation of internal resources and a turnkey solution, the risk of properly maintaining the system increases. As part of the SOW, Ellucian includes training and knowledge transfer materials to permit subsequent administrators to manage the system. However, the materials only go so far. An administrator's knowledge is normally more substantial when the person has hands-on experience during the implementation process. The risk in this lies in future performance, configuration, or reinstallation processes, as there may be a lack of expertise to handle these future projects. Moreover, a similar effect can occur with personnel involved in the project who eventually leave the institution—that knowledge may not be properly shared, leaving Georgetown without the expertise to maintain the software.

To mitigate these risks, Georgetown will need to ensure there is a proper training protocol in place so that the knowledge is shared with current staff members, but also made available in a repository where it can be accessed at a later date. Moreover, this should also include frequent reviews to ensure the information remains up-to-date. Finally, Georgetown can make an informal agreement with Ellucian consultants to allow the University's personnel to be involved during the implementation process through video-sharing conferences that allow the staff member to view the process as the consultant is performing the work. This agreement could

also include recording those sessions so that they become another source of knowledge transfer tools to be made available in the repository.

Measurement

- UIS will monitor data feeds in the test instance and then after live implementation to insure integrity of data.
- Management will conduct satisfaction surveys with faculty and staff after implementation and will implement adjustment to user interfaces, training or extra documentation as needed or as possible.
- UIS will monitor time spent by staff on the project, including meetings, development, testing and any other project related tasks.
- UIS will measure each phase of the project not only to insure that the project is on time and on budget, but to log information for future projects of similar nature.
- A 15% minimum increase in faculty adoption of Canvas is expected after implementation based on Ellucian's statistics for ILP (Ellucian, n.a.). Measurement of LMS will be conducted using the Analytics features in Canvas.

Ethics

Greater ethical implications arise without a proper solution to the integration between Banner and Canvas. Ethical concerns are presented as a result of data inconsistencies related to registration processes and final grades.

Registration Data Inconsistencies

When information fails to synchronize in a timely manner, a student that has registered for a course may not have access to that intended course. Most times, the process is solved within the next day, as previously noted from the UIS website information on course access.

However, issues arise if a student is allowed to register late to a course, drops a course, or is required to access material before a course begins.

Grades

The biggest concern without a connection sending information from the LMS to the SIS is with the final grades. The current process requires faculty members to enter grades in the LMS for students to have access to that information as assignments are graded. The final course grade, however, after being tabulated by the LMS, must be manually re-typed on Banner's web-based portal, MyAccess.

The biggest concern with this process is human error in the process of re-entering grades. A student may receive the incorrect grade, simply out of pressing the wrong key or traversing numbers, or may receive the grade of another student by mistake. A similar issue occurs when a course has more than one student with a very similar, or the same name.

Canvas does not store a student's ID; rather it utilizes the student's username as the unique identifier for the instructor. MyAccess, on the other hand, does not display a student's username and instead displays the student's ID as the unique identifier. The only information tying these records together for an instructor is the student's full name, and if carefully searched, their email address—though this may also be inconsistent.

As one can read, the process has potential for error, and with good reason. At times, faculty and/or student may catch the error on time, but what occurs when this goes unnoticed? Is it ethical for a student to receive the wrong grade? Furthermore, what are the potential ramifications if a grade appeals process is required months, semesters, or years later as a result of this oversight?

Conclusion

At the conclusion of this project, we will have implemented the Intelligent Learning Platform by Ellucian, thus fully integrating the learning management system with the student information system. This project will provide cost efficient solutions to students, faculty, and support staff at Georgetown that will lead to: reduced data management costs involved with managing Banner and Canvas data synchronization; an elimination of custom scripting and batch processing required by IT; instant access for faculty and students to correct courses and student information; fewer support calls from faculty and/or students; a single location for grade entry for faculty, lowering the risk of data entry errors. Down the line, this will also include enhancing new platforms, like the University's mobile app. These improvements will enhance the overall user experience in a cost efficient implementation that will keep the student information system and learning management system in line with the University's IT roadmap and will also keep Georgetown competitive with its contemporaries.

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The website is dedicated to the release of Georgetown's portal GU360.

About. (n.d.). Retrieved from <https://www.georgetown.edu/about>

The site provides general information about the history of Georgetown University, including its mission, and its history as the oldest Jesuit School in the United States. It includes sub sections that highlight other information about the University.

About Us | Canvas Learning Management System. (n.d.). Retrieved November 18, 2018, from

<https://www.canvaslms.com/about-us/>

Canvas information site that has statistics about Canvas, including date founded, employee numbers, client statistics and awards. This site was used to get information on how many schools are currently using Canvas as an LMS.

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Canvas Transition. (n.d.). Retrieved November 21, 2018,

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from <https://www.ellucian.com/Insights/Cloud-Security--What-Higher-Education-Needs-to-Know/>

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Ed Scoop is a website that has current information about learning technology platforms and tools. This article asserts that Canvas has overtaken Blackboard as the top used learning management system among education entities.

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from <https://www.ellucian.com/Software/Ellucian-Intelligent-Learning-Platform/>

Ellucian's website hosts web pages for the different product offerings. This particular page is on the ILP component, listing the benefits, features, functional aspects, and use cases, including case studies.

Ellucian. (n.d.). [Brochure]. Author. Retrieved November 18, 2018,

from <https://www.ellucian.com/Solution-Sheets/Ellucian-Intelligent-Learning-Platform/>

The solution sheet details the function of ILP and the benefits to students, faculty, and institutions.

Faulkner, J., Epstein, T., & Bunte, K. (2015, March 19). *How is ILP different than BEPELI?*

This is a discussion thread posted in the Ellucian Communities platform for Ellucian clients. The discussion relates to identifying the differences between BIEL and ILP.

Tamer Epstein and Kirk Bunte are both Ellucian employees during this time, answering the questions of the original author.

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This site is a subsection of Georgetown's "About" website. It includes key fact sections about Georgetown including "Overview" of the University history, "Traditions" as a Jesuit school, "Academics", as well as Faculty, Degree, Tuition, Application/Acceptance, Enrollment, and Research funding metrics.

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Organizations, Systems and Network Admins. (n.d.). Retrieved November 23, 2018,

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This site gives information and direction related to Georgetown' policies and procedures for the handling of data and for data security for vendors and also Georgetown staff who are charged with working with sensitive data.

Higher education solutions. (2018, October 23). Retrieved December 6, 2018,

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from <https://uis.georgetown.edu/I-do-not-see-my-course-in-Canvas>

Georgetown UIS created a web page to address issues that a faculty member may face if information is missing in Canvas, including a course or enrollment.

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The document focuses on identifying the characteristics to keep in mind when evaluating an LMS, and pays special attention to the support of video.

Salvato, V. (2018, September 27). How Higher Education Can Meet Changing Student

Expectations. Retrieved November 21, 2018, from <https://www.salesforce.org/how-higher-education-can-meet-changing-student-expectations/>

The landing page and the provided eBook cover student expectations and how technology can address student needs. The e-book provides with use cases from different universities and colleges, including Georgetown University's implementation of Salesforce.

Students are Looking for Personalized Digital Experiences (Survey Report). (2017). Retrieved November 21, 2018, from Ellucian website: [https://www.ellucian.com/White-](https://www.ellucian.com/White-Papers/Students-are-looking-for-personalized-digital-experiences/)

[Papers/Students-are-looking-for-personalized-digital-experiences/](https://www.ellucian.com/White-Papers/Students-are-looking-for-personalized-digital-experiences/)

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Bridge is the business product from Instructure, the creators of Canvas. This citation is used to define what an LMS is.

Wright, C., Lopes, V., Montgomerie, T., Reju, S., & Schmoller, S. (2014, April 21). Selecting a

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November 19, 2018, from <https://er.educause.edu/articles/2014/4/selecting-a-learning-management-system-advice-from-an-academic-perspective>

The article goes into detail on all aspects of an LMS, such as different software options, vendors, challenges, selection criteria, and the selection process.