Redesigning an Introduction to Information Systems Course for Scalable Active Learning in Online and Blended Environments

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Abstract

This paper details the evolution of an Introduction to Information Systems course over six years in response to increasing class sizes and different learner populations. The design choices involved with the three versions of this course, along with the changing role of the instructor, as the class shifted from traditional to flipped and active approaches to pedagogy, are explored. This paper also discusses the ways the LMS was leveraged to support these design choices, along with lessons learned and recommendations.

Keywords

Introduction to Information Systems, blended learning, online learning, course evolution, flipped classroom, active learning

Introduction

Instructors are faced with a number of course design challenges when responding to rising course enrollment numbers and the move to online learning. This paper describes approaches used to design a scalable blended and online Introduction to Information Systems (IIS) course that retained the learning-by-doing element that is crucial to providing active learning experiences. This paper covers the evolution of the design of this course over a 6-year period from a small face-to-face course of 25 students to a blended course of over 150 students with a completely online section. Ensuring that the learning was scalable to incorporate increasing numbers of students while retaining its active learning components required extensive course redesigns.

This IIS course introduces lower-division, undergraduate Business majors to Information Systems (IS). The goal of the course is twofold: to increase student interest in IS as a major or minor and to also increase Information Technology (IT) proficiency prior to upper-division non-IS Business courses. This course provides students of all majors with a broad understanding of the role of technology and information systems in the modern business environment. It also equips them with the IT skills necessary to be successful in upper-division quantitative courses. To that end, half of the course covers IS-related topics such as IS strategy and management, while the other half enables students to increase their proficiency in using IT tools by preparing them for Microsoft Office Specialist (MOS) Certification Exams for Excel and Access. The IS topics and the IT skills are taught in parallel, wherein each week students are introduced to new IS topics and new IT skills. Table 1 outlines the focus of the IS topics and IT skills portions of the course, including sample topics covered in both.

The breadth of materials in this course, along with its complex structure can present a challenge to both instructors and students. Equally daunting is the effort required to prepare students to master the IS and IT content, pass certification exams, and retain that knowledge in the years ahead. Over a six-year period of course delivery to different populations of students, we have identified three factors that contribute to achieving these goals: multiple pedagogical techniques (including the flipped classroom, active and collaborative learning, etc.), a thoughtfully designed “self-service” course website, and a scalable course structure that enables adding sections of students with minimal marginal costs. In this paper, we describe
the details of the three stages of evolution that an IIS course underwent to accommodate different populations of learners, focusing on the content delivery, assessment, and the use of Learning Management Systems (LMS). We discuss the insights gained and the benefits of our approach and share recommendations for student success.

<table>
<thead>
<tr>
<th>Information Systems (IS) Topics</th>
<th>Information Technology (IT) Skills</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Basic IT terminology, infrastructure and security issues.</td>
<td>• Problem solving skills using Microsoft Office.</td>
</tr>
<tr>
<td>• How IS can be used for enabling, problem solving, and decision making.</td>
<td>• A certifiable-proficiency in Microsoft Excel 2016 and Microsoft Access 2016.</td>
</tr>
</tbody>
</table>

Sample Topics:
1. The Importance of IS
2. Strategy and Information Systems
3. Hardware, Software and Networks
4. The Cloud
5. Collaboration Information Systems
6. Processes, Organizations, and Information Systems
7. Social Media Information Systems
8. Databases and Business Intelligence
9. Information Systems Development & Management
10. Information Systems Security
11. E-Commerce

Sample Topics in Excel:
1. Creating & Managing Worksheets & Workbooks
2. Managing Data Cells & Ranges
3. Creating Tables
4. Performing Operations with Formulas and Functions
5. Advanced Formulas
6. Creating Charts & Objects
7. Pivot Tables & Pivot Charts

Sample Topics in Access:
1. Create and Manage a Database
2. Build Tables
3. Create Queries
4. Create Forms & Reports

Table 1. Course Overview

Background

IS courses have increasingly begun incorporating a flipped approach for instruction. (Frydenberg, 2012; Lumpkin, 2013; Smith, 2013; Saulnier, 2014; Sharp, 2014; Mukherjee & Bleaney, 2015) This increase is likely due to the benefits flipping can offer, such as increased real-time feedback, improved student-teacher interactions, and deeper levels of student engagement and satisfaction. (Goodwin and Miller, 2013; Zhai, et al., 2017) Shifting the focus of class meetings from “information transfer” via extended lectures to collaboration, discussion, and exploration has been linked to increased gains in learning. (Mazur, 2009, p. 51) In addition, the flipped class is argued to lead to better subject mastery in students. (Sams and Aglio, 2016)

These positive outcomes are in part due to the ways in which a flipped class enables instructors to provide active learning experiences for students. Active learning is generally defined as anything a student does beyond merely listening to a lecture and memorizing facts – instead, students apply course concepts and skills in a variety of complex and often collaborative activities. (Daniel and Tivener, 2016) As Gudigantala affirms (2013), active learning is associated with increased mastery of course concepts in the IS classroom.

The increased opportunity for in-class collaboration and group learning that an active flipped approach can offer is also argued to increase student engagement and learning. Strayer (2012) affirms that students in flipped courses have a higher willingness to work collaboratively than students in traditional (i.e., unflipped) courses. Collaborative learning is positively received by students, as well as instructors, who perceive it as increasing student motivation, positively influencing student performance, and increasing student engagement and learning. (Lage et al., 2010; Opdecam et al., 2014; Lumpkin et al., 2015) With the range of benefits offered by collaborative learning, IS instructors have unsurprisingly embraced their use...
in the classroom. (Harris, 2007; Melin, et al., 2006; Russell, et al., 2014; Woods & Howard, 2014; (Ndabvongo-Dongo and Reed, 2015; Mukherjee and Bleakney, 2016)

Supporting blended learners does require additional planning and support. Song, et al. (2017) argue that flipped learning is a “technology-supported pedagogical innovation” (p. 180), and indeed, the re-designs of the IIS course did require extensive technological support and planning. Hill, et al. (2013) suggest that leveraging the LMS to provide learning resources is crucial to support blended learners, leading to gains in learning compared to traditional learners who did not have access to online resources. Long, et al. (2016) found that videos designed to engage students in terms of focus, pacing, and length did indeed prepare students to excel at completing active learning activities.

We found that the structure and format of the blended class was easily transitioned to a completely online format. The only major component that needed to be substituted was the in-class active learning of the IT Skills. We found that textbook websites, such as MyITLab, could be effectively used in a distance and asynchronous learning environment to recreate the learn-by-doing element of the in-class projects. The following section describes how the IIS course incorporated the above-mentioned pedagogical methods.

**Course Evolution**

Over a period of six years, three versions of the IIS course were designed to convey similar content to different populations of students. Figure 1 describes how the different populations evolved over time. The following sections describe the design choices involved with the three versions of this course re-design along with how the LMS was leveraged to support those design choices, as the course evolved to meet the needs of blended and online learners while providing scalable, active learning.

![](Figure 1: Evolution of IIS Course)

**Version 0: Face-to-Face**

Version 0 was the pilot for the IIS course taught to a small group of 25 hand-picked undergraduate students in the Business major of a large public university. The course met for 2 hours on Mondays and Wednesdays. The IS topics were introduced in a lecture format on the Monday meeting and were assessed using three non-comprehensive objective tests throughout the semester. The IT skills were introduced in live demonstrations on the Wednesday meeting where students were encouraged to follow along with the instructor on their laptops. The students’ mastery of the IT skills was assessed using take home projects and the MOS Certification Exams in Excel and Access. The LMS was used primarily to provide gradebook management, as well as student access to lecture notes and project files for assignments. Figure 2 shows the design of the course site used to support Version 0.

![](Figure 2. Version 0 Design of the Course Homepage)
The pilot course was considered successful as the students performed satisfactorily, however Version 0 had limitations. In-class demonstrations of IT skills were not very effective as not all students were able to follow along with complex skill demonstrations at the same pace. In addition, students often found working on the projects challenging, as the class meetings did not offer sufficient time for the instructor to both cover course content and provide hands-on assistance. Students’ success at attaining certification was impacted by the lack of guided hands-on practice, with a low initial pass rate. The pilot brought to light some of the limitations of the traditional pedagogical methods that were employed. This pilot also demonstrated how some of the pedagogical methods could be modified in order to improve the students’ learning outcomes.

**Version 1: Blended**

After the launch of the pilot, the IIS course was initially scaled to one section of 50 students, and in subsequent semesters scaled to three sections of 60 students each. Version 1 was designed to provide a blended learning experience where a large portion of the content delivery was presented online, while the active learning components and a large portion of the assessments was conducted in a face-to-face environment.

The IS topics were still presented via lectures, but were recorded in front of a live class to enable students to watch and re-watch lectures as needed. This is a common practice in the College for large classes with multiple sections as it makes efficient use of available resources while offering students the flexibility of attending a live lecture or viewing the lecture online. These recorded lectures were made available to the students through the university’s media streaming service outside of the LMS. The assessment of the IS topics were expanded to include weekly online quizzes that served as a review of the topics covered that week but also motivated consistent student engagement with the course materials.

IT skills were presented using a flipped classroom approach. In place of in-class demonstrations, the content was presented in short tutorial videos that were posted on the LMS and reinforced using in-class group projects. The IT skills were recorded as short videos (30 seconds to 5 minutes) that focused on demonstrating a specific skill. This method was selected so that students could search for and refer to specific videos when preparing for their assessments and exams rather than having to re-watch longer videos that covered a large range of skills. These videos were integrated within the LMS so that they could be easily searched for and located (see Figure 3 for an example).

![Figure 3. Version 1 Design of the Course Excel Topics Page](image)
approach than Version 0, with every additional section of 60 students only requiring two more hours of class time, along with the support of the TAs. Moreover, with this approach, the TA resources were used more effectively to assist and mentor students rather than offline grading of assignments.¹

For this version of the course, the design of the LMS evolved to accommodate the nature of the flipped classroom, and the larger and more varied population of students. The course site homepage was dynamic, changing each week to reflect the current and upcoming weeks’ multiple due dates and deliverables (see Figure 4 for an example). The course site components were organized to ensure that students were able to easily and quickly identify what needed to be done every week for the IS and IT tracks.

![Figure 4. Version 1 Design of the Course Homepage](image)

Version 1 produced better learning outcomes for a larger number of students, including an increased initial pass rate for certification exams to 99%.² This model also increased student engagement by incorporating a number of pedagogical techniques intended to increase students’ active learning opportunities. The hands-on, in-class group projects encouraged collaboration and interaction amongst the students while also providing students with in-person guidance and assistance by the instructor and TAs. This approach also reduced the student-instructor team ratio, which can often be high in large classes.³ The low-stakes weekly project and quizzes encouraged students to consistently engage with the course material while providing multiple assessment opportunities, which led to higher performance in the high-stakes tests and certification exams. The additional advantage of this model was that from an instructor’s perspective, it is highly scalable and only requires an additional 2 hours a week for each section of 60 students. The only drawback was that Version 1 of the course design was not able to accommodate fully online learners.

**Version 2: Blended and Online**

After running Version 1 of the IIS course successfully for 4 semesters, it was extended to include a purely online format in order to accommodate a state legislative mandate to provide lower-cost, fully-online

¹ For the first two semesters one TA was available, however additional funding was procured in order to add a second TA. This resulted in an increase in the size of the instructor team (instructor and TAs) that students had access to ultimately improving their experience. TAs are drawn from the pool of high-performing undergraduate students from past semesters who are committed to mentoring and supporting their peer group.

² This pass rate is the highest in the country.

³ Version 1’s student-instructor team ratio is 60:3 compared to 25:1 for Version 0.
degrees. As a result, Version 2 of the redesign needed to meet the needs of not only blended but online learners, as well.

Instead of the live recorded lectures, the format of the IS topics were changed to pre-recorded short, highly-re-watchable segments. To further spark student interest in IS, these video segments were supplemented with additional content from other educational resources and news stories highlighting the latest advances in technology and their applications. This supplemental material also included notes prompts that encouraged students to review the material and further research topics using the online resources available to them. The assessment model remained the same as Version 1, and included weekly quizzes and three non-comprehensive tests.

The IT skills content was delivered in the same fashion as Version 1 using short video demonstrations. The IT skills assessment portion of the course is where the experience of the online learners diverged from that of the blended learners. For the blended learners, the course retained the in-class group projects used in Version 1. Since the online learners do not have the option to work on projects in groups (due to technical infeasibility, the need to support asynchronous learning, and potential academic integrity issues), this classroom-based component was replaced with projects administered through the textbook website (e.g. MyITLab), enabling students to complete equivalent skills-intensive IT projects online in a highly supportive environment. Assistance and guidance were provided to the students using a variety of techniques that ranged from email to short, personalized video demonstrations.

For this version of the course, extensive changes were made to the LMS to accommodate the new population of fully online learners and to replace the administrative announcements that were made at the beginning or ending of the recorded lectures. The LMS was modified in the following ways:

1. The homepage was revised to include dynamic weekly updates of priority information, such as links to exams and other timely reminders (see Figure 5). Extensive cross linking was done to minimize the number of links students had to follow in order to get to the content they needed to review. This helped alleviate any confusion that students might have regarding weekly instructional content and assessments.

2. Since the course schedule is quite complicated, the syllabus is presented in the LMS using multiple techniques – including a syllabus homepage, detailed and cross-referenced course materials page with links to the sources of the materials, an extensive Frequently Asked Questions, a syllabus video, and an up-to-date course calendar tool. To encourage students to review the more important aspects of the syllabus, they were given credit for completing a syllabus quiz.  

   ![Figure 5. Version 2 Design of the Course Homepage](image)

4 The syllabus quiz is an all-or-nothing quiz worth 3% of the course grade. Students are allowed 2 weeks to complete this quiz with unlimited attempts and without a time limit.
3. Comprehensive test-prep pages were developed that included study guides designed to prepare students for the MOS certification exams and the three tests.

4. As the course moved away from two-hour recorded live lectures to multiple instructor-created short videos, this video content was organized using individual topic pages that linked to the videos related to the topic. These topic pages also included lecture notes and worksheets, and were cross-referenced to the related assessments (see Figure 6 for an example). This stronger organizational scheme made it easier for the students to navigate the course website.

![Figure 6. Version 2 Design of the Course IS Topics Page](image)

5. To further alleviate any confusion that students might experience when navigating the course site, the language used on the course site was modified to fully explicate any links that were provided. For example, instead of creating a link called “Test 1 Study Guide,” the link was instead called “Click for Date, Time, Location and Study Guide for Test 1.” Figure 6 provides an example of this approach to wording.

6. To provide the element of active learning for the IT skills portion of the class to the online-only students, the MyITLab textbook website was incorporated into the LMS. In lieu of in-class completion of the projects, online students were able to complete the projects themselves and receive immediate feedback on their performance from the automated grading tools available through MyITLab. The instructor was able to provide additional personalized assistance and guidance through multimedia tools, such as Jing, which was used to create short video responses to email questions.

All of these features of the LMS have contributed to the sustained high levels of student performance while minimizing student confusion and, consequently, effort on the part of the instructor. While setting up the course website can be a considerable task prior to the beginning of the semester, maintenance is minimal during the semester itself. This design of the course website makes it a “self-service” environment for the students, where they are guided and can easily find the information that they need at any given point of time during the semester.

The additional benefit of this approach is that the instructor is able to focus on creating better and up-to-date content and providing more personalized interaction with students related to the course content. Thus, the instructor’s efforts are used to support student mastery of the material via a mentoring relationship rather than dealing with student emails about course logistics.

Despite these changes to the content delivery and the incorporation of a new population of students, Version 2 was able to maintain the learning outcomes and scalability of Version 1. While the population of online-only students had a great deal of variance in skills and prior experience, this approach enabled the majority to master the course concepts at their level and succeed in the course. Using the available technology and tools, the instructor was able to provide asynchronous, active-learning experiences to those students unable to take the course on campus.
Conclusions & Recommendations

The evolution of the IIS course is summarized in Table 2. Transitioning from the traditional approach to a blended approach for this type of course content was found to significantly improve student learning outcomes and performance. The blended learning environment created an effective foundation to include online learners. We experienced continued student success in terms of high certification pass rates and high scores.

<table>
<thead>
<tr>
<th>Version 0: Face-to-Face</th>
<th>Version 1: Blended Learning</th>
<th>Version 2: Blended + Online</th>
</tr>
</thead>
<tbody>
<tr>
<td>Duration</td>
<td>1 semester</td>
<td>5 semesters</td>
</tr>
<tr>
<td>Class Size</td>
<td>45 On-Campus Students</td>
<td>180 On-Campus Students in 2-3 sections</td>
</tr>
<tr>
<td>IS Topics</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Content Delivery</td>
<td>Live Lectures</td>
<td>Live Lectures Recorded</td>
</tr>
<tr>
<td>Assessment</td>
<td>Tests</td>
<td>Weekly online Quizzes &amp; Proctored Tests</td>
</tr>
<tr>
<td>IT Skills</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Content Delivery</td>
<td>Live Demonstration</td>
<td>Short Demonstration Videos</td>
</tr>
<tr>
<td>Assessment</td>
<td>Take Home Projects</td>
<td>In class group projects</td>
</tr>
<tr>
<td></td>
<td>Certification Exam</td>
<td>Certification Exams</td>
</tr>
<tr>
<td>LMS Support</td>
<td>Minimal*</td>
<td>Heavy**</td>
</tr>
</tbody>
</table>

*Minimal use of LMS was limited to sharing course files and grades

**Heavy use of LMS included weekly course schedules, sharing of course files, course calendar and short video tutorials. Pre-recorded lectures were provided through external video streaming service.

***Heaviest use of LMS add the use of textbook integration and all lecture videos in addition to the content being provided in Version 1.

Table 2: Summary of Different Versions of Course

In our experience, there were three main drivers for the continued success of this course. First, multiple pedagogical methods were used to appeal to a varied population of students. The course content presentation was designed to increase retention, and inspire interest and engagement in the subject area. The technique found to be most effective was the flipped classroom approach using short concise video lectures (in place of long recorded live lectures). These videos were supported with research prompts and recommended (but not assessed) further reading and videos. This strategy gave students the option to either read or watch videos or research relevant online resources. These pedagogical techniques were supported using multiple assessment techniques and numerous assessment opportunities. This strategy allowed us to incorporate active learning techniques in a large classroom. Second, the LMS was designed to be a “self-service” platform for students. The course homepage was designed as a weekly launch pad where students could find links to the assigned content and assessments, with all course content thoroughly cross-referenced. This strategy created a seamless environment for the students that set them up for success and eliminated the burden of sifting through files and assignments, enabling them to channel that time to engage with the content and complete assessments in a timely fashion. Finally, the course supported scalability by minimizing the marginal cost per each section of students by leveraging TA support appropriately. Moreover, this course also provided flexibility through the modularization of content. This allowed the instructor to keep up with frequent technology-driven changes in the business world that related directly to the subject matter and update modules of the course as needed.

An unexpected but welcome outcome of this design is the improved instructor experience. The role of the instructor of this course has also evolved along with the course itself. In our experience, the instructor’s role during the semester has shifted from being a lecturer responsible for weekly knowledge transfer to a mentor focused on personalized interactions and engaging with students in a more meaningful way.
The lessons that we have learned over the 6-year period can be applied to any IIS or Management Information Systems (MIS) course regardless of whether the focus of the course is on IS topics or IT skills. Our recommendations for designing a blended and/or online course are as follows. First, creating a modular course is an effective way to introduce students to a large number of new ideas or concepts and allow them to engage with each topic in a meaningful way. It also has the added benefit of allowing the instructor to modify and update the course on a continuous basis with minimal effort. This modular setup is also an ideal structure for multiple assessments that encourage students to regularly engage with the course content and ultimately leads to student success. Second, creating a “self-service” course website through the LMS will lead to better student performance, optimizing the student-instructor team ratio, wherein the instructors and TAs can use their time on personalized interactions focused on learning and mentoring rather than on course logistics, administration, or grades. A key recommendation in designing the course website is to minimize redundancy on the website (so that students can find the information in one place and the instructor only has to update that one location) while maximizing the redundancy in terms of linking to the information in multiple places to guide students to the information or content that they need.

References


